ELECTRICAL WORLD

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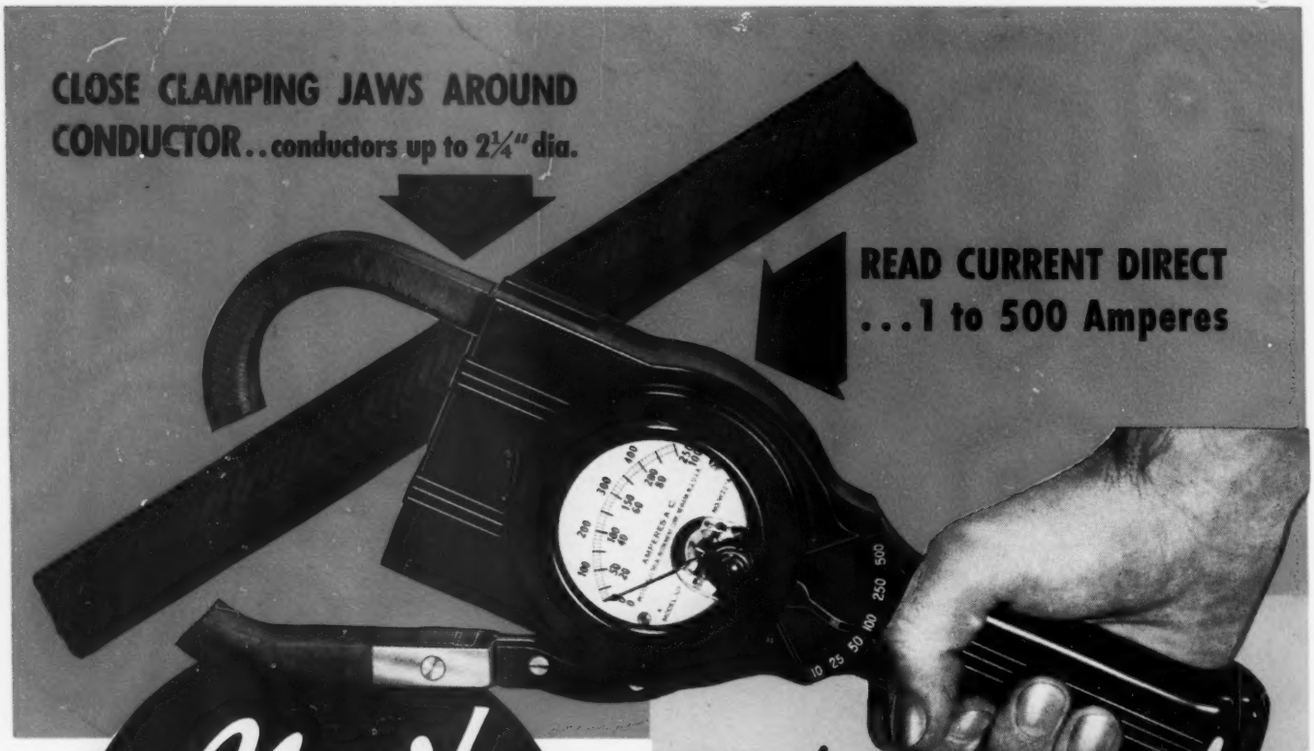

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ELECTRICAL WORLD

JANUARY 14, 1939

STABILITY

STRENGTH in men or in corporations lies not in their capacity "to make hay while the sun shines," but rather in their ability to withstand the shocks of adversity. Last year was anything but a good business year. It was, however, a year for testing strength and character.

The statistical analysis of the year with respect to the electrical industry, as it is developed in this issue, brings out one thing of major significance, and that is the stability of the electric utility industry. What other industry could have successfully withstood the repeated shock of government investigation, punitive legislation and subsidized competition, mounting taxes and lower rates, besides the enervating effects of a depression?

It is this stability which the industry can count on to attract investors when the time comes that large amounts of new capital are needed. What are some of the elements of this strength? A glance at the statistics shows the following:

GROWTH—Since 1929 output has increased 24 per cent. General business decreased 29 per cent.

ADEQUATE CAPACITY—The growth in output from 1929 to 1938 was 22 per cent; the increase in capacity 23.5 per cent.

NEW CUSTOMERS—Since 1929 3,600,000, average of 400,000 a year. New customers last year 600,000.

LOW COST TO USER—Sixty per cent of the lower average residential rate was earned last year by increased usage, against 40 per cent by rate reduction. Low brackets are bringing increased volume.

MANAGEMENT EFFICIENCY—With all the increased cost of fuel, supplies, labor, the operating ratio shows no increase.

RESTORED PUBLIC CONFIDENCE—Out of 161 PWA municipal ownership projects in 1938 only 50 were in places that had been completely served by private operation. Even with large loans and grants people are voting more against municipal ownership than for it.

BETTER FINANCING—Every refinancing issue was successful. Substantially lower interest rates prevail, thereby reducing fixed charges.

BALANCED BUSINESS—Although production is off 5 per cent, gross is virtually unchanged, due to increased residential and commercial usage offsetting industrial losses. It has the greatest customer diversity of almost any business.

These are the elements which go to make up stability and which can be demonstrated statistically. They are not the only elements, for we have such things as essentiality of service, increasing application, regulation, sound engineering, better equipment, balanced financing, selective selling, dealer co-operation.

It is upon this stability, this firm foundation, that the utility industry is going to grow and offer greater opportunities for creative employment and for productive investment.

The utility industry today is strong.

ANNUAL STATISTICAL NUMBER
JANUARY 14, 1939

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HIGHLIGHTS

TO give the reader a quick picture of what the electrical industry accomplished in 1938, these highlights are presented. In a depression year, the electrical industry, while down, suffered substantially less than business in general. With higher business levels continuing into the new year and with the new output records set late in the past year, the outlook is encouraging.

Output: 109,000,000,000 kw.-hr.
Dipped 5 per cent under 1937, but set new all-time highs in late weeks of year. Hydro had record year; purchased energy continued growth (page 70).

Capacity: 36,000,000 kw.
Four per cent gain in year which saw 5 per cent drop in output offsets talk of power shortage. Technological gains give added dependability (page 72).

New Capacity: 1,700,000 kw.
Additions in steam generating capacity highest since 1930 and 43 per cent above 1937. Transmission and substations just over 1937 (page 76).

Energy Sales: 93,400,000,000 kw.-hr.
Wholesale commercial down 17.7 per cent, all others up. Residential sales up 10 per cent; farm sales, 6; retail commercial, 5; (page 76).

Revenue: $2,173,000,000
Gross maintained at 1937 level, despite drop in output. Residential usage rose to 850 kw.-hr.; rate dropped to 4.2 cents (page 84).

Customers: 27,800,000
Gained 2.2 per cent. All classifications up, but residential gain only half of previous year (page 86).

Rate Reductions: $16,100,000
State commissions report reductions considerably less than those in 1937 and somewhat under 1936 (page 88).

Municipal Ownership
Out of 161 PWA projects only 50 invaded utility territory. Voters turning down free money. Federal power projects buying private properties (page 89).

Expenses: $1,018,000,000
Tax bill of 16.7 per cent sent expenses other than cost of money to new high of 53 per cent. Operating ratio kept at 37.7 per cent (page 90).

Financing: $962,000,000
Nearly 90 per cent of total was for refunding purposes. Three utilities accounted for 41 per cent of total financing by the industry (page 92).

Budgets: $413,000,000
Preliminary estimates place capital expenditures 4.5 per cent under 1938, with transmission and distribution slightly above last year (page 94).

Electrical Manufacturing: $1,600,000,000
Comparison of indices shows electrical manufacturing at 97, general business at 80 for last year. Rapid recovery in last half (page 96).

OUTPUT

Energy Production Index Better Than General Business — All-Time Peaks for Hydro Generation — Purchased Energy Small, Yet Growing Steadily

ON THE average during 1938 the general business index was approximately 29 per cent below that of 1937, but, true to form, the dip in electrical industry kilowatt-hours was only a fraction as much. The deficiency was actually only 5 per cent.

There were similar jogs in 1920 and in 1929-1932. Each of the two recent ones proved to be only a breathing spell to grander heights. Despite those setbacks the power output has never been dissuaded from its irresistible determination to rise and to outstrip general business in the rate of advance.

For any one who hesitates to see healthiness in a decrease that can at best be called encouragingly small there are the records made in the late weeks of the year. Early in November the output curve crossed through the 1937 and for the three pre-Christmas weeks the output established new all-time highs, easily topping the new highs established in September of the previous year. It certainly is still as significant as ever that folks and industries were using in the unpretentious year that was 1938 better than 24 per cent more kilowatt-hours than in the banner year that was 1929.

Private and municipal utilities together generated in their own plants in 1938 some 109 billion kilowatt-hours, and this constituted 95.8 per cent of what they handled for delivery to users. The difference, 4,850,000,000, came from the aluminum and paper industries, from government hydro developments or from across the Canadian border. Examination of the figures of net purchased energy over the years shows a persistent increase that more than holds its own with the growing total of utility output. Some of it is due to taking Boulder Dam energy and the rest reflects a tendency to strike agreements with industries that have power to spare from their process operations.

It was another good hydro year, so the industry drew from its hydro plants a little more than in 1937; actually it proved to be the biggest hydro year in history independently of Boulder, TVA or any other government enterprise. Quite naturally, with more hydro from within the industry and more energy derived from outside the industry, the shrinkage came in steam generation. Actually there was practically 10 per cent fewer kilowatt-hours ground out by the steam turbine-generators than in 1937. It was, however, practically equal to the steam-electric output of 1936 and both are 13 per cent higher than the best previous year, which was 1930.

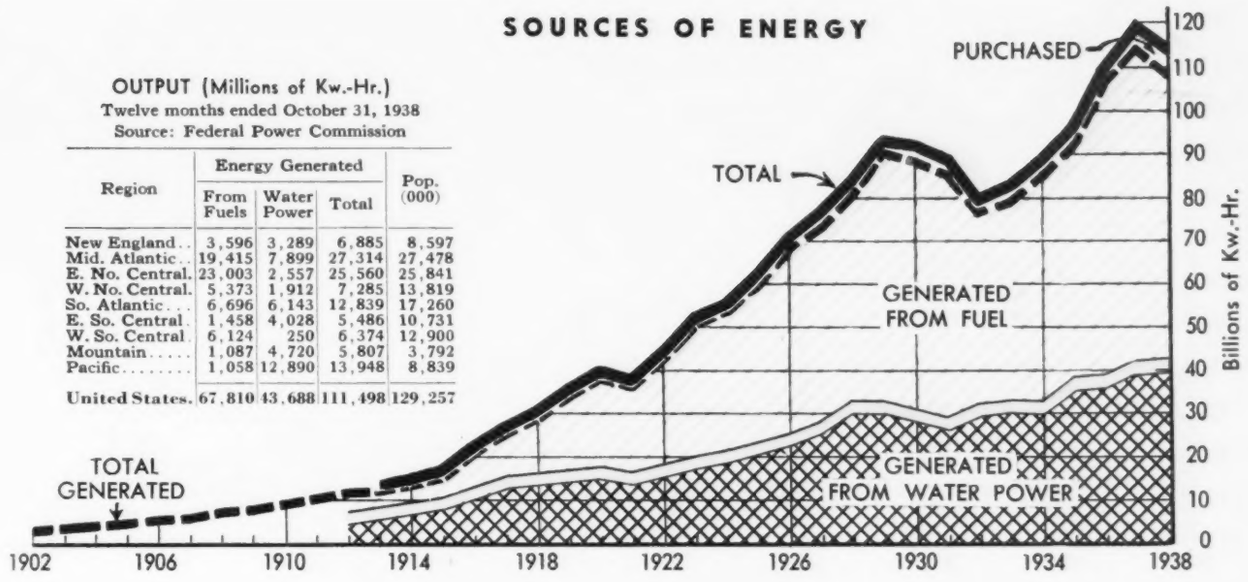
Total company use of energy in their own operations had been decreasing encouragingly; however, it appears to have taken a jump forward when generation and sales were, on the contrary, reduced. Reports indicate that this is more a matter of accounting than of actuality because of the shifting status of electric railway departments on the books. It is probably that the companies are still using less than 2 per cent incidental to such operations as building and yard lighting, testing, etc.

Ultimate use was 6 per cent less than in the preceding year, and with output slipping only 5 per cent it is evident that losses in transmission and distribution were, relatively speaking, slightly greater. This is a quite natural consequence of a system progressively geared to higher outputs. Reaching, as will be seen, for an increased draught from water-power sources involved longer average distances of transmission and more loss of energy that does not reach the consumer.

SOURCES OF ENERGY

OUTPUT (Millions of Kw.-Hr.)
Twelve months ended October 31, 1938
Source: Federal Power Commission

Region	Energy Generated			Pop. (000)
	From Fuels	Water Power	Total	
New England	3,596	3,289	6,885	8,597
Mid. Atlantic	19,415	7,899	27,314	27,478
E. No. Central	23,003	2,557	25,560	25,841
W. No. Central	5,373	1,912	7,285	13,819
So. Atlantic	6,696	6,143	12,839	17,260
E. So. Central	1,458	4,028	5,486	10,731
W. So. Central	6,124	250	6,374	12,900
Mountain	1,087	4,720	5,807	3,792
Pacific	1,058	12,890	13,948	8,839
United States	67,810	43,688	111,498	129,257

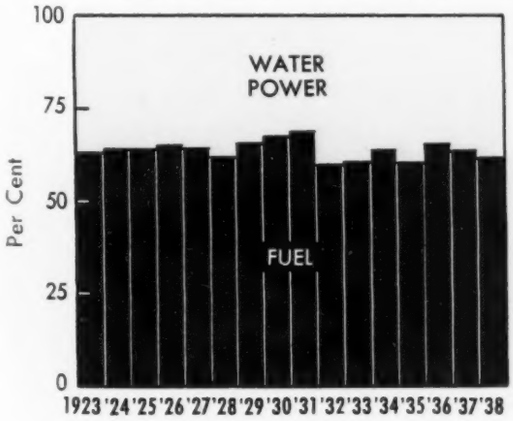


SOURCE AND DISPOSAL OF ENERGY (Millions of Kw.-Hr.)

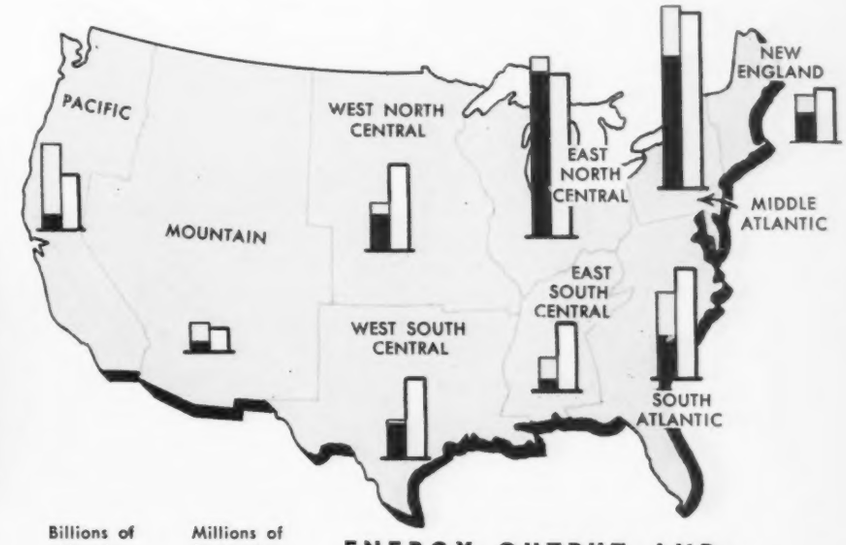
Year	Generated by			Total Generated	Net Purchased	Total Net Input	Total Company Use	Losses and Energy not Accounted for	Sales to Ultimate Consumers
	Steam	Water Power	Internal Combustion						
1926	44,145.9	23,843.8	(b)	67,989.7	2,486.3	70,476.0	2,552.5	11,834.2	56,089.3
1927	46,862.5	26,381.9	(b)	73,244.4	3,124.7	76,369.1	2,458.6	12,659.3	61,251.2
1928	49,446.5	31,006.9	(b)	80,453.4	2,940.7	83,394.1	2,564.3	13,841.8	66,988.0
1929	59,128.1	30,956.3	(b)	90,084.4	2,672.7	92,757.1	2,480.0	14,982.6	75,294.5
1930	59,387.0	29,204.7	(b)	88,591.7	3,365.1	91,956.8	2,489.7	14,561.0	74,906.1
1931	58,037.7	27,537.6	(b)	85,575.3	2,825.2	88,400.5	2,336.5	14,162.1	71,901.9
1932	45,204.5	30,800.7	708.9	76,714.1	2,978.2	79,692.3	2,117.9	13,863.6	63,710.8
1933	46,871.1	31,356.5	705.4	78,933.0	3,478.0	82,411.0	1,972.5	14,522.8	65,915.7
1934	53,106.3	31,069.1	810.4	84,985.8	3,367.3	88,353.1	2,153.1	15,118.4	71,081.6
1935	55,197.4	36,543.6	870.4	92,611.4	3,252.4	95,863.8	2,168.3	16,099.5	77,596.0
1936	68,423.0	37,230.6	912.7	106,566.3	3,119.0	109,685.3	2,276.2	17,364.8	90,044.3
1937	74,206.3	40,959.3	(b)	115,165.6	4,644.7[c]	119,810.3	2,322.9	18,041.1	99,446.3
1938[a]	67,600.0	41,400.0	(b)	109,000.0	4,850.0	113,850.0	2,650.0	17,800.0	93,400.0

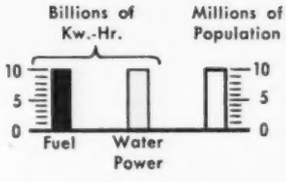
(a) Ten months actual, two months estimated.
(b) Included with steam generation.
(c) Large part of increase due to energy received from Boulder Dam.
Source, Edison Electric Institute.

HYDRO AND STEAM GENERATED ENERGY



ENERGY OUTPUT AND POPULATION





CAPACITY

Power Shortage Refuted by Statistics — Technological Improvements Make Equipment More Dependable — Supplanted Equipment Suggested for Defense Use

REFUTATION that the electric utilities have demurred and deferred to the danger point in their installation of generating capacity is found in a comparison of the years elapsing since 1929. In that nine-year period energy use has increased 22 per cent. At the same time the utilities have augmented their generation facilities by 23.5 per cent. It is reasonable, then, to deduce that if there was no critical power shortage impending during the 1929 boom year there could likewise be none now, assuming, of course, that peaks have retained the same proportion to capacity. Actually the peaks are probably less relatively because selective load building is beginning to be instrumental in bettering the load factor. Also, the prevailing shorter work hours in industry have tended to avert some of the former overlaps that create peaks.

Additions in net terms to the generating plants of the nation's electric power systems amounted in 1938 to practically 1,000,000 kw. This represents a 4 per cent gain for a year in which the output shrank even more than the capacity grew. Ignoring all other considerations, the plants were, therefore, 8 or 9 per cent more capable of handling the demand upon them than they were a year ago. This margin is merely another way of deducing that there is at the moment no critical shortage of power generation facilities. The first sustained growth in load —and the recent topping of all previous records of output may well be sustained— will of course absorb this margin unless capacity increments maintain a pace that provides an appropriate margin.

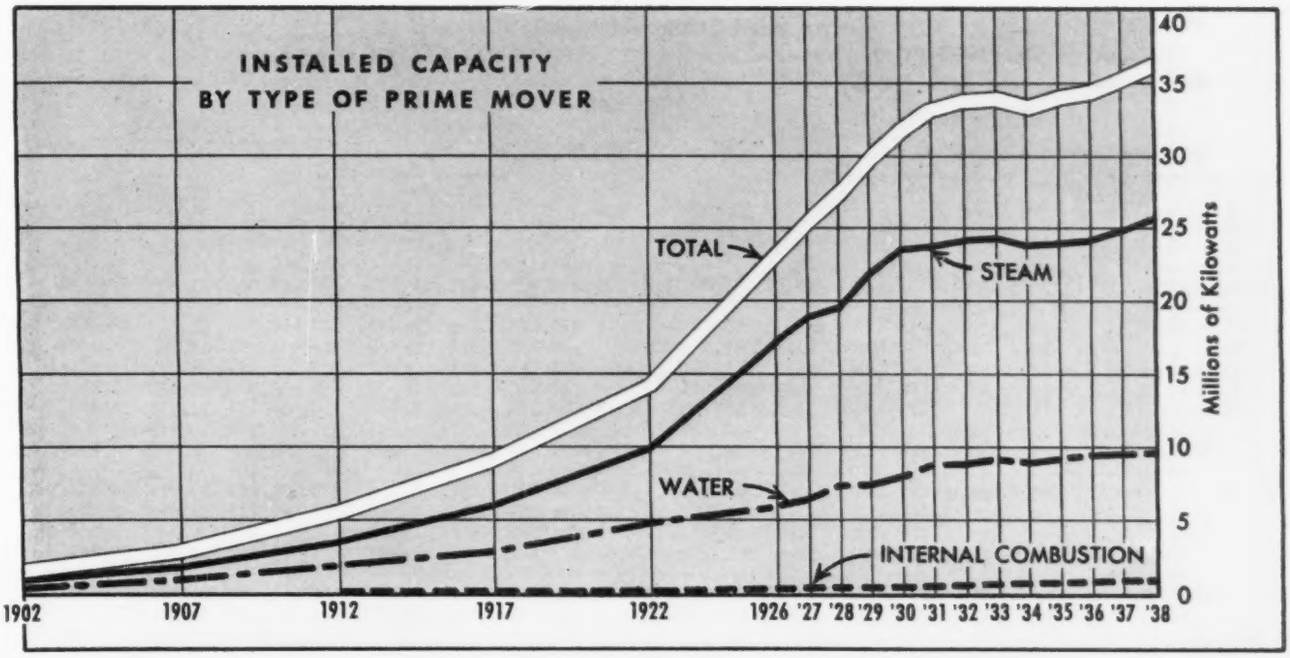
Technological considerations are ignored, however, when the comments are confined to the cold figures. Competency to meet the load is not solely a matter of nameplate ratings. It is a matter of reliability for day-in and day-out functioning, especially on the peaks, when capacities are taxed. Therein reposes an untold and perhaps unmeasurable margin of reliable competency, because all through the depression years the companies have been devoting talent and money to the bolstering of their systems and stations to improve continuity of service.

Circuit breakers and the relaying of faults have been speeded up so as to clear trouble promptly before generators are deprived of their loads and loads deprived of their generators. Lightning is being deflected with increasing certainty. System faults are being averted and removed with increasing positiveness. Bottlenecks are being eliminated by system rearrangement. System inflexibilities have been corrected. Stations have been revamped and fortified to ride through disturbances. Flood protection has been reinforced. All these technical benefits redound to the ability of a kilowatt to function more consistently in the face of impediments. Surely these should be accounted a credit on the capacity side.

Nevertheless, the demands are growing, and anything like an early pick-up in 1939 of the 5 per cent slump in 1938 is certain to revive the issue of generating capacity. Having applied back-up safeguards more or less comprehensively, it stands to reason that the revival of output in prospect will necessitate a new spurt in generation increments merely to keep one jump ahead of the draft.

At another place it will be pointed out that 1,695,998 kw. of new capacity was installed in new or existing stations. Since the net gain was only 962,000 kw., it appears that some 733,000 kw. of capacity was set apart for uncredited reserve use or for junking. Some of that was so nearly worn out or so hopelessly obsolete as to warrant no further consideration. Much of it was.

[*Continued on page 75*]

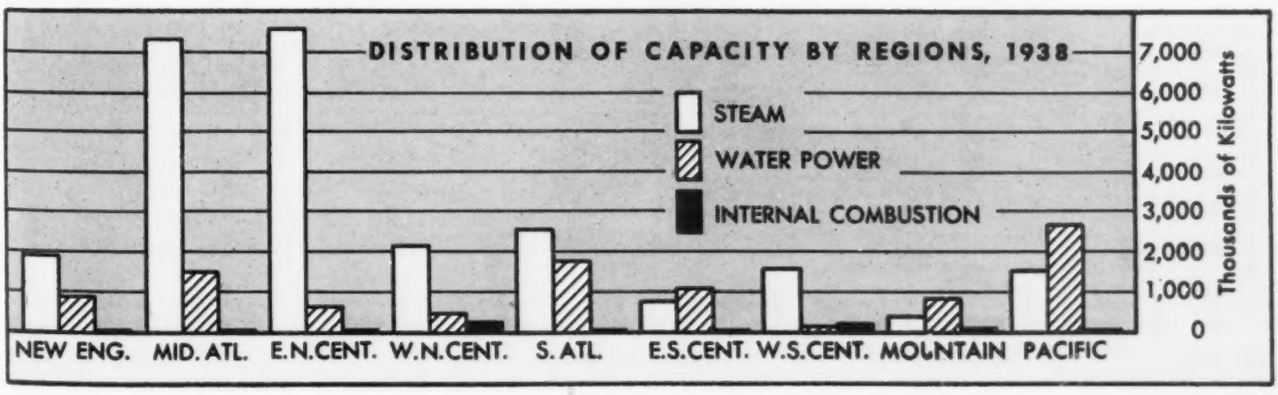


GENERATOR RATING by Regions and by Type of Prime Mover

Edison Electric Institute (Thousands of Kilowatts)

Region	1929				1932				1935			
	Steam	Water Power	Int. Comb.	Total	Steam	Water Power	Int. Comb.	Total	Steam	Water Power	Int. Comb.	Total
United States...	21,744	7,438	376	29,558	24,215	8,919	459	33,593	23,921	9,219	608	33,749
New England.....	1,724	582	6	2,312	1,835	818	6	2,659	1,759	800	9	2,568
Mid. Atlantic.....	5,747	1,141	20	6,908	6,667	1,405	28	8,100	6,916	1,501	27	8,444
E. No. Central....	6,848	537	23	7,438	7,447	627	27	8,101	7,116	609	50	7,775
W. No. Central...	1,663	302	111	2,076	1,936	453	155	2,544	1,892	470	203	2,565
So. Atlantic.....	2,184	1,299	37	3,520	2,285	1,713	47	4,045	2,238	1,677	60	3,975
E. So. Central....	691	634	25	1,350	741	639	24	1,404	720	844	27	1,591
W. So. Central....	1,289	19	114	1,422	1,487	88	119	1,694	1,484	100	143	1,727
Mountain.....	279	732	32	1,043	312	743	44	1,099	327	744	55	1,126
Pacific.....	1,289	2,192	8	3,489	1,505	2,433	9	3,947	1,469	2,474	34	3,977

	1936				1937				1938 Est.			
United States...	24,107	9,539	614	34,260	24,638	9,634	688	34,960	25,600	9,700	700	36,000
New England.....	1,768	808	10	2,586	1,828	836	13	2,677	1,870	850	14	2,734
Mid. Atlantic.....	6,963	1,516	29	8,508	6,987	1,480	34	8,501	7,290	1,481	34	8,805
E. No. Central....	7,187	623	43	7,853	7,330	627	55	8,012	7,590	638	55	8,283
W. No. Central...	1,976	462	212	2,650	2,052	436	230	2,718	2,150	436	233	2,819
So. Atlantic.....	2,270	1,702	56	4,028	2,429	1,731	66	4,226	2,530	1,738	66	4,334
E. So. Central....	710	1,004	27	1,741	713	1,011	28	1,752	730	1,011	28	1,769
W. So. Central....	1,453	101	147	1,701	1,501	101	155	1,757	1,560	101	158	1,819
Mountain.....	345	765	51	1,161	371	783	62	1,216	390	815	68	1,273
Pacific.....	1,435	2,558	39	4,032	1,427	2,630	44	4,101	1,490	2,630	44	4,164



GENERATOR RATING—Public Utility Power Plants*

Central Station, Municipal, Railway and Other

Preliminary November 1, 1938 (Courtesy of Federal Power Commission)

Division and State	†Companies	*Plants	Total Capacity Kw.	Generator Capacity of Plants Operated By									
				One Type of Prime Mover						Combination of Two or More Types			
				Water Power		Steam Power		Internal Comb. Engines		Total		Water Power, Cap.	Steam Power, Cap.	Int. Comb. Engines, Cap.
				No.	Cap.	No.	Cap.	No.	Cap.	No.	Cap.			
United States	1,720	3,854	38,334,644	1,401	10,693,097	1,217	26,212,279	1,001	616,612	235	812,656	221,699	479,978	110,979
New England	146	337	2,948,633	231	818,449	69	2,004,520	10	9,289	27	116,375	20,858	93,408	2,109
Maine	26	76	238,698	61	180,358	7	54,730	4	948	4	2,662	1,300	800	562
New Hampshire	15	57	297,388	45	231,434	4	41,585	1	780	7	23,589	3,527	19,675	387
Vermont	25	72	174,042	62	160,142	3	9,800	0	0	7	4,100	1,500	2,400	200
Massachusetts	55	81	1,328,549	35	152,410	36	1,100,215	3	6,240	7	69,684	12,931	55,793	960
Rhode Island	6	11	234,871	5	3,350	5	231,300	1	221	0	0	0	0	0
Connecticut	19	40	675,085	23	90,755	14	566,890	1	1,100	2	16,340	1,600	14,740	0
Middle Atlantic	138	398	9,431,394	215	1,394,478	144	7,846,030	21	28,258	18	162,628	120,775	36,630	5,223
New York	71	245	5,386,475	177	1,109,813	51	4,248,628	7	17,341	10	10,693	3,455	2,830	4,408
New Jersey	16	27	1,124,832	4	3,320	16	1,109,700	4	2,717	3	9,095	3,980	5,000	115
Pennsylvania	51	126	2,920,087	34	281,345	77	2,487,702	10	8,200	5	142,840	113,340	28,800	700
East North Cent.	323	654	8,375,328	270	639,026	286	7,522,215	62	44,985	36	169,102	14,124	139,475	15,503
Ohio	72	110	2,262,685	8	12,150	88	2,239,886	13	8,049	1	2,600	600	2,000	0
Indiana	59	98	1,157,538	21	34,500	62	1,112,229	14	10,534	1	275	0	60	215
Illinois	65	94	2,360,567	11	47,777	66	2,209,158	12	7,934	5	95,698	3,368	89,170	3,160
Michigan	63	180	1,654,137	121	302,287	36	1,326,919	12	9,258	11	15,673	2,575	4,330	8,768
Wisconsin	64	172	940,401	109	242,312	34	634,023	11	9,210	18	54,856	7,581	43,915	3,360
West North Cent.	444	797	2,973,344	114	472,638	237	2,158,726	392	223,267	54	118,713	11,688	76,994	30,031
Minnesota	67	133	668,896	41	154,536	49	488,492	31	14,362	12	11,506	1,878	4,027	5,601
Iowa	94	172	644,834	27	123,245	61	405,288	72	45,961	12	70,340	4,535	57,960	7,845
Missouri	65	107	734,318	7	150,545	35	540,401	63	41,404	2	1,968	0	888	1,080
North Dakota	16	36	72,208	0	0	17	65,744	19	6,464	0	0	0	0	0
South Dakota	34	58	74,047	6	4,260	9	42,747	40	22,994	3	4,046	0	940	3,106
Nebraska	89	160	301,597	26	33,416	34	216,054	83	35,071	17	17,056	4,465	3,970	8,621
Kansas	79	131	477,444	7	6,636	32	400,000	84	57,011	8	13,797	810	9,209	3,778
South Atlantic	170	415	4,581,749	150	1,946,579	138	2,436,962	98	58,467	29	139,741	39,321	88,957	11,463
Delaware	7	8	34,675	0	0	4	31,200	4	3,475	0	0	0	0	0
Maryland	12	26	634,794	3	271,385	11	355,712	10	4,807	2	2,890	0	770	2,120
District of Col	2	3	257,400	1	2,400	2	255,000	0	0	0	0	0	0	0
Virginia	30	70	495,345	31	88,941	19	308,325	12	6,680	8	91,399	15,716	73,750	1,933
West Virginia	16	39	673,378	10	100,880	18	567,510	8	4,427	3	561	100	175	286
North Carolina	34	84	991,962	52	651,123	22	333,275	6	4,800	4	2,764	905	250	1,609
South Carolina	15	40	634,485	23	488,240	9	125,492	6	3,163	2	17,590	12,300	5,200	90
Georgia	20	60	483,769	27	329,417	24	136,826	5	1,254	4	16,272	10,100	5,262	910
Florida	34	85	375,941	3	14,193	29	323,622	47	29,861	6	8,265	200	3,550	4,515
East South Cent.	83	208	1,952,828	35	1,164,217	94	760,013	68	23,707	11	4,891	290	2,807	1,794
Kentucky	20	39	362,356	3	104,860	24	253,253	7	2,498	5	1,745	290	775	680
Tennessee	25	64	600,008	20	389,627	30	205,593	11	2,998	3	1,790	0	1,460	330
Alabama	15	43	927,057	12	669,730	20	252,870	11	4,457	0	0	0	0	0
Mississippi	23	62	63,407	0	0	20	48,297	39	13,754	3	1,356	0	572	784
West South Cent.	177	408	1,875,821	27	139,773	115	1,558,275	250	139,254	16	38,519	569	26,842	11,108
Arkansas	26	53	155,918	5	67,008	25	78,704	21	9,201	2	1,005	0	410	595
Louisiana	35	60	314,258	0	0	12	290,905	46	21,428	2	1,925	0	937	98
Oklahoma	56	101	337,413	2	1,200	26	294,187	67	37,679	6	4,347	419	1,293	2,635
Texas	60	194	1,068,232	20	71,565	52	894,479	116	70,946	6	31,242	150	24,202	6,890
Mountain	152	343	1,938,784	151	1,371,674	77	466,546	82	49,601	33	50,963	8,999	13,485	28,479
Montana	12	32	332,396	18	321,320	5	6,765	6	1,679	3	2,632	180	1,476	976
Idaho	16	47	258,432	39	253,890	2	600	3	1,612	3	2,330	1,660	0	670
Wyoming	22	37	51,451	7	14,582	17	31,134	9	3,821	4	1,914	1,250	372	292
Colorado	34	72	281,120	21	63,015	31	207,398	14	8,056	6	2,651	1,285	300	1,066
New Mexico	18	38	101,914	1	80	12	83,089	22	13,955	3	4,790	834	1,430	2,525
Arizona	21	45	244,812	12	127,050	8	77,810	20	15,615	5	24,337	0	7,407	16,930
Utah	22	60	159,890	46	88,387	2	59,750	5	2,800	7	8,953	3,390	0	5,563
Nevada	7	12	508,769	7	503,350	0	0	3	2,063	2	3,356	400	2,500	456
Pacific	87	294	4,256,763	208	2,746,263	57	1,458,992	18	39,784	11	11,724	5,075	1,380	5,269
Washington	30	71	1,013,256	48	792,823	14	215,370	4	1,094	5	3,969	2,145	880	944
Oregon	27	70	445,409	44	259,901	17	177,300	5	2,238	4	5,970	2,030	500	3,440
Califronia	30	153	2,798,098	116	1,693,539	26	1,066,322	9	36,452	2	1,785	900	0	885

* Includes all plants generating energy for public use having a monthly output of 10,000 kilowatt-hours or more.

† Only companies and municipalities that have generating plants. Excludes those purchasing all of their energy. This figure includes 97 duplications because of companies operating in more than one State.

GENERATING FACILITIES

By Type of Prime Mover (Kw.)

Electric Light and Power Industry

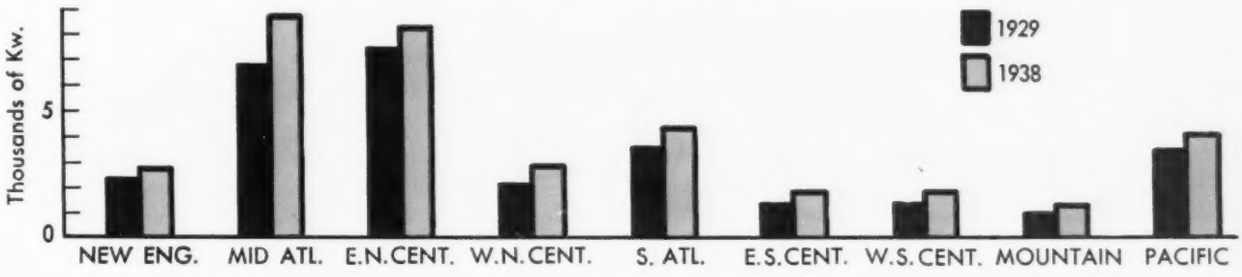
Year	Steam	Water Power	Internal Combustion	Total
1926..	17,031,712	6,095,556	†	23,127,268
1927..	18,723,783	6,554,321	†	25,278,104
1928..	19,645,799	7,278,989	295,875	27,220,663
1929..	21,743,602	7,438,882	376,153	29,558,637
1930..	23,427,058	8,206,732	416,129	31,889,919
1931..	23,823,017	8,806,096	447,793	33,076,906
1932..	24,358,777	8,922,969	582,326	33,864,072
1933..	24,165,698	8,974,887	593,035	33,733,620
1934..	23,780,148	9,140,690	603,633	33,524,471
1935..	23,989,227	9,288,537	610,541	33,888,305
1936..	24,106,618	9,538,640	614,813	34,260,071
1937..	24,637,926	9,634,014	688,381	34,960,321
1938*.	25,600,000	9,700,000	700,000	36,000,000

* Preliminary estimate. † Included with steam.

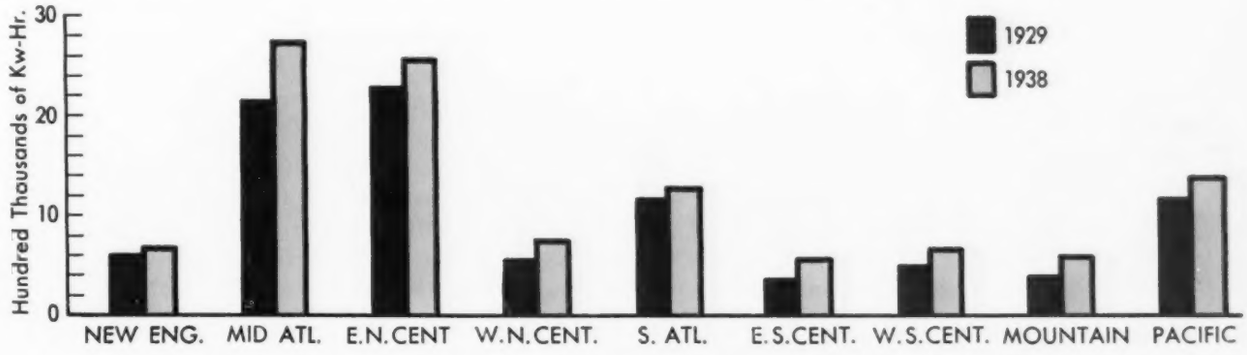
however, superseded merely because it could not function efficiently or conveniently on routine load curves, nor even on the customary peaks. But for such extraordinary peaks it might well serve in a pinch if kept available. There's a thought that seems to have been given little consideration in the recent discussion of power for defense.

Except for the extraordinary flood outages along Long Island Sound at the time of the hurricane there were fewer major station interruptions due to conditions originating within utility power plants than in 1937. Extensive remodeling of the metropolitan and other stations which were affected are either completed or in process. In so far as this modernization assures the ability of a kilowatt to function for longer periods without overhaul and maintenance and to ride through accidental disturbances without damage or loss of load, they are destined to allow a smaller margin of system reserve. These facts should be taken into account by those who fear that margins at the moment are uncomfortably small.

GROWTH IN CAPACITY BY REGIONS



GROWTH IN OUTPUT BY REGIONS



GROWTH IN CAPACITY AND OUTPUT

by Regions, 1929 to 1938

Region	Capacity (1,000 Kw.)		Incr. Per Cent	Output (1,000,000 (Kw.-Hr.)		Incr. Per Cent
	1929	1938		1929	1938*	
New England	2,312	2,734	18.2	5,997	6,885	14.8
Mid. Atlantic	6,908	8,805	27.2	21,605	27,314	26.4
East North Central	7,438	8,283	11.1	22,786	25,560	12.1
West North Central	2,076	2,819	36.0	5,387	7,285	35.2
South Atlantic	3,520	4,334	23.2	11,763	12,839	9.0
East So. Central	1,350	[a]1,955	45.0	3,398	5,486	61.5
West So. Central	1,422	1,819	28.0	4,890	6,374	13.2
Mountain	1,043	[b]1,603	53.5	3,785	5,807	53.5
Pacific	3,489	4,164	19.2	11,810	13,948	18.0
United States	**29,558**	[c]**36,516**	**23.5**	**91,421**	**111,498**	**22.0**

* Twelve months ended Oct. 31. [a] 1,760 excl. T.V.A. [b] 1,273 excl. Boulder.
[c] 36,000 excl. T.V.A. and Boulder additions.

NEW CAPACITY

Steam Increments Outdo the Three Preceding Years Combined—Transmission and Substations Budgeted for Still More in 1939

MORE new steam generating capacity was added to utility power systems in 1938 than in any year since 1930. In fact, it amounted to practically as much as in the three years 1935-36-37 combined. It exceeded what was done in the immediately preceding year by no less than 43 per cent. The industry has manifestly resumed and accelerated its program of not only keeping up with the load but keeping comfortably ahead of it.

Of course, not all of this fresh capacity constitutes a net addition to the country's power plants. In all the eight years since 1929 there have been added 4,277,189 kw., but the net gain in the interval has been only 2,173,000 kw. Thus, in the interim, more than 2,000,000 kw. of old capacity has been discarded in the process of modernizing power plants and rendering them more capable of efficient and reliable production of energy. This sustained program is sure to show its benefits in better economic performance in the era just ahead.

Higher is the word most fittingly characterizing what has been going on. Ratings are higher than for the units superseded, but few steam units even approach the 100,000- and 200,000-kw. ratings which were the vogue in large stations earlier in the decade. Steam pressures and temperatures are higher, steaming rates are higher, extraction is the practice in a higher percentage of installations, rotational speeds are higher, and with them goes the practice of hydrogen cooling to attain lesser rotational losses and better dissipation.

Proportions of hydro and steam have fluctuated widely during the decade. In 1938 there was added only one-fourth as much hydro as steam. So far it looks as if a couple of big blocks of government power will run the hydro increments in 1939 up to half the amount of steam budgeted. When all is said and done, however, there is little evidence of even a sizable temporary drift away from a long-term trend of twice as much steam generation as hydro.

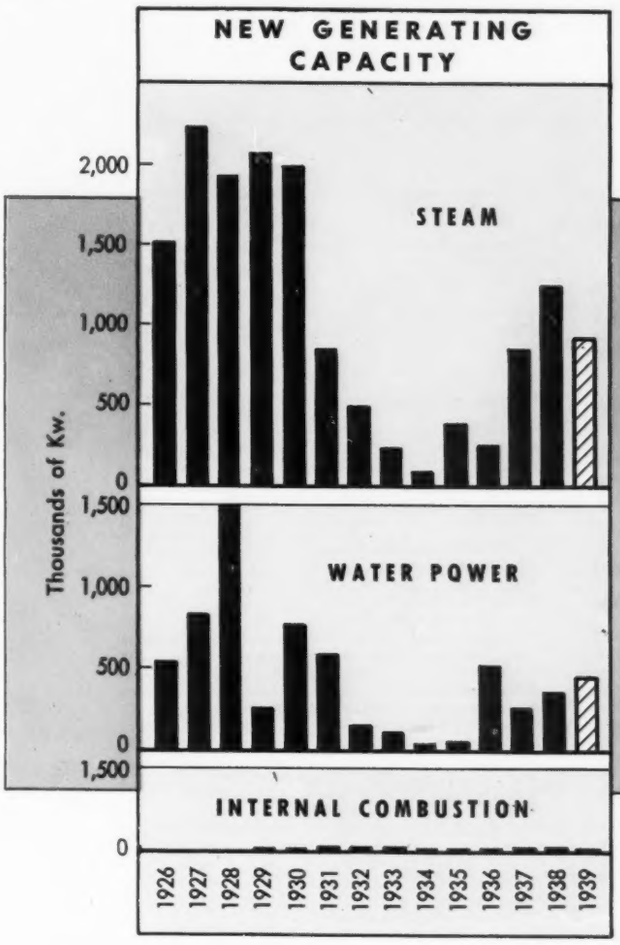
Most significant among the inferences to be drawn from the data is the startling ratio ($7\frac{1}{2}$) of capacity added in existing steam plants to that installed in new stations. Some obsolescent units are being superseded, while others have been retained and superposed.

Private and municipal plants combined installed just under 100,000 kw. of new hydro generation, whereas of steam they added more than 1,327,000 kw. It was the federal government's increments in hydro which brought that 1938 steam-hydro ratio for the nation from 13.2 down to 3.83.

Internal combustion additions reported for 1938 totaled (for private and municipal utilities) to only 23,000 kw. and promises for 1939 to amount so far to only 11,585 kw.

Despite the fear that 1938 would show a lesser increment of new transmission mileage than 1937, the year did exceed, very slightly however. Forecast from company reports for 1939 is a mileage of 6,479, an amount 25 per cent greater than the past year. It looks like a good year for high-voltage lines.

Kva. rating of new substations just outdid the amount installed in 1937 and the encouraging fact is that 1939 is scheduled for a similar amount—each of the three years about three times as good as was 1936. All areas share in this activity, with the Pacific and East South Central sections, however, contributing the bigger increases in sight for 1939.

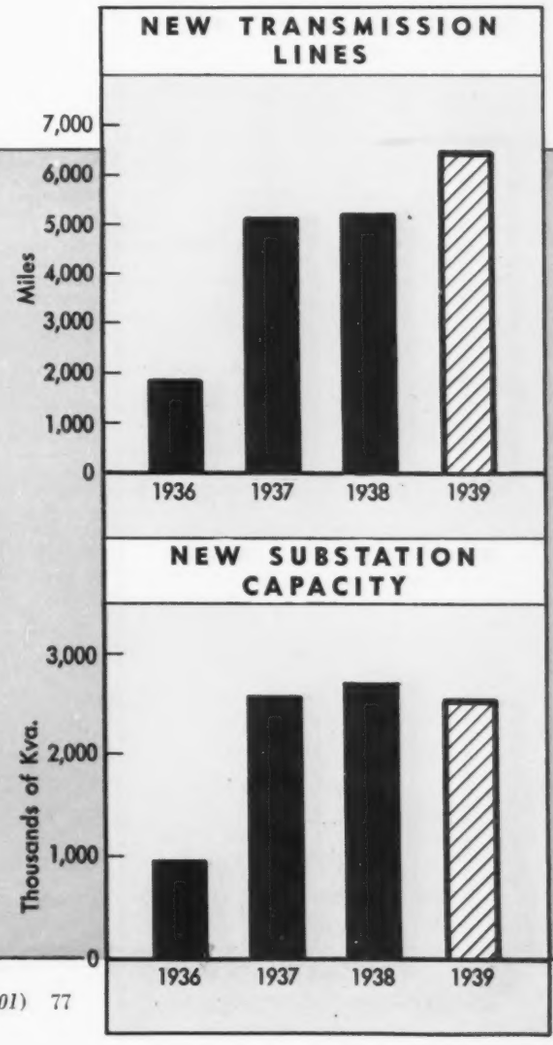


NEW GENERATING CAPACITY ADDED EACH YEAR

as reported to Electrical World for the entire industry

Year	Kilowatts			Total
	Steam	Water	Int. Comb.	
1926...	*1,514,000	†518,000	(s)	2,034,000
1927...	*2,240,000	†818,000	(s)	3,058,000
1928...	1,935,500	†1,520,000	(s)	3,455,500
1929...	2,075,285	†249,200	5,800	2,329,485
1930...	2,034,527	748,480	6,420	2,789,437
1931...	821,100	566,500	15,400	1,403,000
1932...	457,750	126,155	8,550	592,455
1933...	215,775	95,325	35,250	346,350
1934...	47,000	41,900	5,805	94,705
1935...	345,325	38,950	1,815	386,090
1936...	211,900	‡489,865	19,328	721,093
1937...	851,100	245,346	22,314	1,118,760
1938...	1,327,239	345,605	23,064	1,695,908
1939a..	921,750	463,400	11,585	1,396,735

* Kw. estimated, based on kva. reported.
† Kw. estimated; reported wholly or partly in hp.
‡ Incl. Boulder,165,000, Norris 100,000.
a Scheduled for completion during year, or early 1940.
s Included with steam.



CONSTRUCTION OF TRANSMISSION LINES (Miles)

Region	1936	1937	1938	1939 (est.)
New England.....	69	127	99	227
Middle Atlantic.....	85	279	361	646
East North Central.	220	785	882	1,065
West North Central.	238	553	295	435
South Atlantic.....	455	798	617	775
East South Central..	90	428	810	975
West South Central.	149	615	674	570
Mountain.....	214	750	305	703
Pacific.....	319	802	1,113	1,083
United States.....	1,839	5,137	5,156	6,479

Source, "Electrical World"

CONSTRUCTION OF SUBSTATIONS (Kva.)

Region	1936	1937	1938	1939 (est.)
New England.....	94,300	146,000	123,154	152,608
Middle Atlantic.....	137,591	510,635	346,731	312,023
East North Central.	222,000	597,000	649,312	716,209
West North Central.	129,000	322,000	198,942	186,938
South Atlantic.....	179,000	440,000	368,000	265,500
East South Central..	43,000	88,000	430,000	441,500
West South Central.	36,200	191,000	104,700	67,200
Mountain.....	63,500	124,000	106,418	97,883
Pacific.....	21,300	193,000	422,208	363,350
United States.....	925,891	2,611,635	2,749,465	2,603,011

Source, "Electrical World"

GENERATING CAPACITY ADDED IN 1938

Steam

	New Plants, Kw.	Additions, Kw.
Private Companies		
Hartford Electric Light	.....	40,000
Public Service of N. H	20,000	.....
New England Power Assoc	.....	2,800
Wellsboro Electric	.....	1,500
Philadelphia Electric	.....	50,000
New York State Elec. & Gas	20,000	.....
Rochester Gas & Elec	.....	25,000
Metropolitan Edison	.....	7,000
Pennsylvania Electric	.....	3,264
American Water Works & Elec	.....	30,000
Long Island Lighting System	.....	75,000
Consolidated Edison of N. Y.	.....	123,000
Public Service Elec. & Gas, N. J	.....	50,000
Cleveland Electric Illuminating	.....	50,000
Nappanee Utilities	1,250	.....
Detroit Edison	.....	75,000
Central Ohio L. & P	5,000	.....
Columbia Gas & Electric	.....	100,000
Toledo Edison	.....	5,000
Central Illinois	.....	25,000
So. Indiana Gas & Electric	.....	20,000
Ohio Edison	.....	20,000
Ohio Public Service	.....	6,000
Wisconsin Electric Power	.....	13,700
Consolidated Water Power	.....	7,500
Iowa Power & Light	.....	35,000
Iowa Electric L. & P	.....	5,000
Sioux City Gas & Elec. & Iowa Pub. Service	.....	10,000
Central Kansas Power	.....	3,500
Montana Dakota Utilities	.....	1,100
Springfield Gas & Electric	.....	15,625
Nebraska Power	5,000	.....
Kansas Gas & Electric	23,000	.....
Northern States Power & Subs	.....	35,000
Potomac Edison & Subsidiary	30,000	.....
Duke Power	.....	55,000
Potomac Electric Power	.....	35,000
Louisville Gas & Electric	.....	2,500
Southwestern Gas & Electric	.....	15,000
Panhandle Power & Light	7,500	.....
Texas-New Mexico Utilities	.....	7,500
Dallas Power & Light	31,250	.....
Gulf States Utilities	.....	27,500
New Orleans Public Service Inc	.....	30,000
Albuquerque Gas & Electric	.....	6,250
Public Service Co., Colorado	.....	5,000
Central Arizona L. & P	.....	12,500
Red River Lumber Company	.....	2,500
Pacific Gas & Electric	.....	50,000
Pacific Power & Light	.....	2,000
Total	143,000	1,085,739
Municipal Plants		
Jamestown, N. Y	.....	15,000
Washington, Indiana	.....	3,000
Dover, Ohio	2,500	.....
Galion, Ohio	.....	3,000
Norwalk, Ohio	.....	2,500
Bluffton, Ohio	.....	2,000
Jasper, Indiana	.....	2,000
Woodstock, Ill	.....	4,000
Owatonna, Minn	.....	2,500
Fairmont, Minn	.....	2,500
Chillicothe, Mo	.....	2,500
Grand Island, Neb	.....	5,000
Kansas City, Kansas	.....	30,000
Fairbury, Neb	.....	2,500
Valley City, N. Dak	.....	2,500
Rocky Mount, N. C	.....	7,500
Thomasville, Ga	.....	2,500
Fort Pierce, Fla	.....	2,500
Dyersburg, Tenn	4,500	.....
Total	7,000	91,500

Hydro

	New Plants, Kw.	Additions, Kw.
Private Companies		
Cumberland County P. & L	6,650	.....
Public Elec. Light, St. Albans, Vt	3,000	3,000
Bangor Hydro-Electric	.....	7,000
Orange & Rockland Electric	.....	225
New York State Elec. & Gas	.....	120
American Water Works, Inc	.....	1,000
Wisconsin Power & Light	.....	2,500
American Gas & Electric	14,760	.....
Wisconsin Public Service	.....	2,600
Northern States Power	.....	600
Montana Power	56,000	.....
Portland General Elec	275	.....
Washington Gas & Electric	.....	75
Total	80,685	17,120
Municipal Plants		
Holyoke, Mass	800	.....
Danville, Va	10,000	.....
Tennessee Valley Authority	72,000	.....
Bureau Reclamation Boulder City	.....	165,000
Total	82,800	165,000

Internal Combustion

Private Companies		
Provincetown Electric	.....	150
New York State Elec. & Gas	.....	148
Minnesota Utilities	.....	340
Sioux City Gas & Elec., Iowa Pub. Service	.....	981
Dakota Power	.....	1,500
Louisiana Ice & Electric	.....	3,000
Oklahoma Electric & Water	.....	250
Arizona Edison Company, Inc.	.....	1,600
Salt River Valley Water Users Assoc	5,000	5,000
Utah Power & Light	.....	185
Total	5,000	13,154
Municipal Plants		
Carthage, Mo	.....	1,500
Greenville, Texas	.....	1,410
Lubbock, Texas	.....	2,000
Total	.....	4,910

GENERATING CAPACITY TO BE ADDED IN 1939

Steam

	New Plants, Kw.	Additions, Kw.
Private Companies		
Boston Edison	.....	25,000
Pennsylvania Power	.....	35,000
Pennsylvania Elec. Co	.....	35,000
American Water Works & Elec	.....	60,000
Detroit Edison	.....	60,000
Central Ohio L. & P	.....	5,000
American Gas & Elec	.....	60,000
Northern Ind. Public Ser	.....	9,500
Commonwealth Edison	.....	[a]150,000
Otter Tail Power	.....	10,000
Sioux City Gas & Elec. — Iowa Pub. Ser	.....	1,000
Kansas Utilities	.....	1,000
Kansas Electric Power	10,000	.....
St. Joseph Ry. Light, Heat & Power	.....	7,500
Northern States Power Co. & Subs	10,000	5,000
Duke Power	80,000	.....
Virginia Public Service	.....	15,000
Virginia Elec. & Power	.....	40,000
Consolidated Gas, El. Light & Power	.....	25,000
Houston Lighting & Power	.....	25,000
Gulf States Utilities	.....	33,500
Albuquerque Gas & Electric	.....	2,500
Pacific Gas & Electric	50,000	.....
Total	150,000	605,000
Municipal Plants		
Orrville, Ohio	.....	2,500
Piqua, Ohio	.....	4,000
Martins Ferry, Ohio	.....	3,750
Columbus, Ohio	.....	10,000
Crawfordsville, Ind	.....	5,000
Frankfort, Ind	.....	10,000
Anderson, Ind	.....	10,000
Springfield, Ill	.....	15,000
Coldwater, Mich	.....	2,500
Muscatine, Iowa	.....	7,500
Ames, Iowa	.....	3,000
Hagerstown, Md	.....	5,000
Greenville, N. C	.....	5,000
Lakeland, Fla	.....	5,000
Orlando, Fla	.....	10,000
Jacksonville, Fla	.....	40,000
Dyersburg, Tenn	.....	3,000
Jonesboro, Ark	.....	3,000
Lamar, Colo	.....	2,500
Glendale, Calif	20,000	.....
Total	20,000	146,750

Hydro

	New Plants, Kw.	Additions, Kw.
Private Companies		
Central Maine Power	8,000	.....
Rockland Light & Power	6,750	.....
Wisconsin Power & Light	.....	2,500
American Gas & Elec	75,000	.....
Michigan Public Service	500	.....
Wisconsin Public Service	.....	17,250
Potomac Edison & Subsidiary	.....	1,000
Salt River Valley Water Users Assoc	.....	3,000
Southern California Edison	82,500	(Leased)
Total	172,750	23,750
Municipal Plants		
Holyoke, Mass	500	.....
Highpoint, N. C	21,000	.....
Tennessee Valley Authority	48,000	.....
Bureau Reclamation, Denver	32,400	.....
Bureau Reclamation Boulder City	.....	165,000
Total	101,900	165,000

Internal Combustion

	New Plants, Kw.	Additions, Kw.
Private Companies		
Maine Public Service	2,100	.....
Sioux City Gas & Elec.—Iowa Pub. Ser	.....	1,000
Southern Nebraska Power	.....	2,000
Central Kansas Power	.....	400
Western Public Service	.....	1,500
Tidewater Power	.....	1,100
American Utilities	.....	335
Central Power & Light	.....	480
Arizona Edison Company, Inc.	.....	1,360
North Continent Utilities	260	.....
Sierra Pacific Power	.....	50
Total	2,360	8,225
Municipal Plants		
Fort Morgan, Colorado	.....	1,000

[a] Tentative, 1940.

GENERATING CAPACITY ADDED IN 1938

	Private Companies	Municipal and Federal	Total
Steam	1,228,739	98,500	1,327,239
Water power	97,805	247,800	345,605
Int. comb'n	18,154	4,910	23,064
Total	1,344,698	351,210	1,695,908

GENERATING CAPACITY SCHEDULED FOR 1939

	Private Companies	Municipal and Federal	Total
Steam	755,000	166,750	921,750
Water power	196,500	266,900	463,400
Int. comb'n	10,585	1,000	11,585
Total	962,085	434,650	1,396,735

STATION ECONOMICS

Hours Use of Hydro at Peak of 4,260 Hours — Steam Down to 2,580 — Coal Consumption Improved Another Point

HARDLY a better index can be cited of the immediate ability of electric utility power plants to meet the loads now being imposed upon them than the "hours use" to which steam generation was put in 1938. Hydro admittedly was used more intensively than at any time in thirteen years and steam generation suffers relatively when hydro is worked to full advantage. But in 1938 the 2,580 average hours use for steam was 4 per cent less than the average value for the years (1928, 1929 and 1937) when hydro was worked to about the same number of hours as in 1938. It was the largest year ever in hydro kilowatt-hours, but the capacity had also grown, so that hours use of hydro proved just equal to the previous high figure of 4,260 hours in 1928.

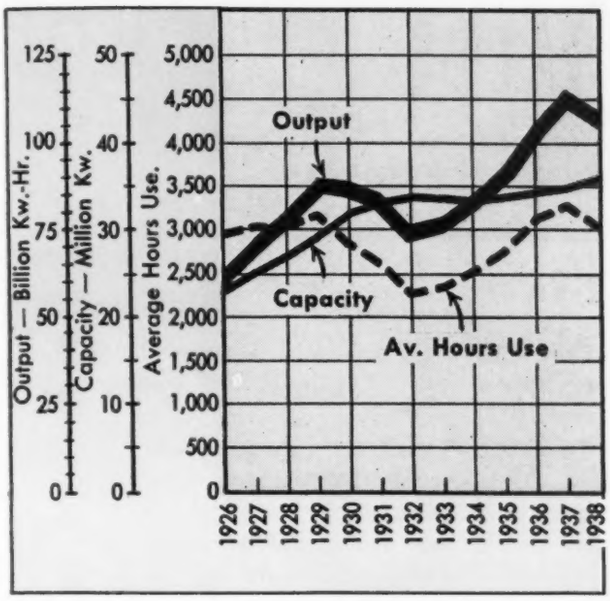
With hydro generation working at a new high level and with total output of steam and hydro down some 5 per cent it was natural that hours use of fuel-driven equipment should shrink. Again, the appreciable steam capacity increments in a year when hydro increase was small, when water was plentiful and when total demand was decreased tended to give steam a present margin of capacity which belies the fear of immediate insufficiency. This in no way ignores the fact that steam generated kilowatt-hours were greater in 1938 than in any except the two immediately preceding years.

Taking the hydro and steam together, the over-all use for output was down from the 3,294 hours of 1937 to 3,030, which, nevertheless, was better than any year (except 1928 and 1929) in the preceding twelve years. The industry manifestly is not only steadily improving the design of systems so that equipment expenditures are used more effectively but also is having more confidence in the reliability factor. The latter comes about through protective measures incorporated to prevent damage to equipment when inevitable faults occur, and thus keep them riding through disturbances that otherwise would occasion interruptions to service.

Nor should this discussion of marginal capacity be terminated without mentioning the industry's wholesome tendency of cultivating loads which make for more kilowatt-hours output for a given value of peak demand. This moves toward less need for marginal equipment that can only be used for a few peak hours and thus dilutes the average earning capacity of all the capital devoted to generation.

Meanwhile, without ever a setback, the industry has steadily raised the amount of energy extracted from a pound of coal. The pounds of coal per kilowatt-hour was down another point to 1.42 from the 1937 figure of 1.43. This striving for better thermal efficiency is never ignored, but relatively more stress was placed on it before financial stringency hit the industry. This worthy objective is now somewhat overshadowed by the necessity of making generation capital stretch more widely over the kilowatts. Superposed turbines, consolidation of steam generation into larger and more efficient units, freer resort to steam extraction for reheat, introduction of more water walls and economizers in conjunction with the boilers are all moves during the year's activity which have sustained the progress toward more kilowatt-hours per pound of fuel.

Despite the new gain in efficiency of generation the industry is using about the same amount of coal (40,200,000 tons) as it was using in the late 1920's. More gas was used than ever before (except in 1937) and oil use has also been steadily increasing.



OUTPUT, CAPACITY, AVERAGE USE

Electric Light and Power Industry

Year	Energy Generated (Millions of Kw.-Hr.)	Generating Capacity End of Year (Kw.)	Output per Kw. of Av'ge Cap. (Kw.-Hr.)*
1926...	67,990	23,126,268	2,985
1927...	73,244	25,278,104	3,026
1928...	80,453	27,220,663	3,065
1929...	90,084	29,558,637	3,184
1930...	88,592	32,049,919	2,876
1931...	85,575	33,076,906	2,628
1932...	76,714	33,864,072	2,292
1933...	78,933	33,733,620	2,335
1934...	84,986	33,524,471	2,527
1935...	92,611	33,888,305	2,748
1936...	106,566	34,260,071	3,127
1937...	115,166	34,960,321	3,330
1938†..	109,000	36,000,000	3,070

* Equivalent to average hours use of capacity.
† Preliminary.

OUTPUT, CAPACITY, AVERAGE USE (by Source of Energy)

Source—Edison Electric Institute. (Electric Light and Power Industry Only)

Year	Energy Generated (Millions of Kw.-Hr.)		Generating Capacity at End of Year (Kw.)		Output per Kw. (Kw.-Hr.)†	
	From Fuel*	From Water Power	Steam*	Hydro	Steam	Hydro
1926....	44,146	23,844	17,032,000	6,096,000	2,590	3,920
1927....	46,863	26,382	18,724,000	6,554,000	2,500	3,960
1928....	49,446	31,007	19,942,000	7,279,000	2,480	4,260
1929....	59,128	30,956	22,120,000	7,439,000	2,680	4,160
1930....	59,387	29,205	23,843,000	8,207,000	2,480	3,560
1931....	58,038	27,537	24,271,000	8,806,000	2,390	3,120
1932....	45,913	30,801	24,941,000	8,923,000	1,840	3,460
1933....	47,577	31,356	24,759,000	8,975,000	1,930	3,500
1934....	53,917	31,069	24,384,000	9,141,000	2,210	3,400
1935....	56,068	36,543	24,600,000	9,288,000	2,280	3,940
1936....	69,336	37,230	24,721,000	9,539,000	2,800	3,910
1937....	74,206	40,959	25,326,000	9,634,000	2,930	4,250
1938‡...	67,600	41,400	26,300,000	9,700,000	2,580	4,260

* Includes internal combustion. † Equivalent to average hours use of capacity.
‡ Estimated, on the basis of ten months' operations.

OUTPUT FROM FUEL AND FUEL CONSUMPTION

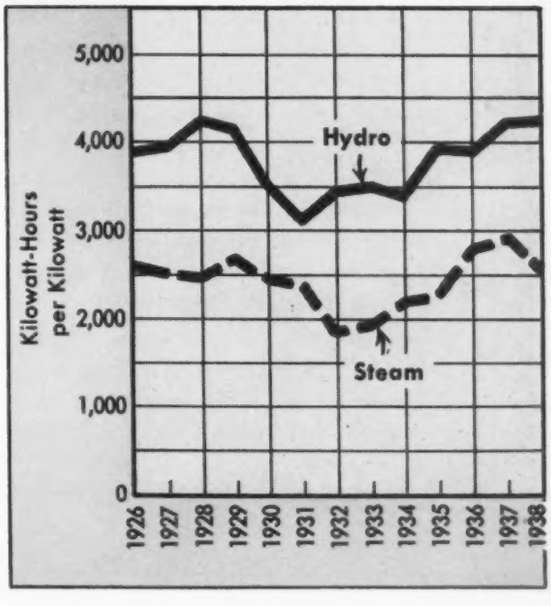
All public utility plants — Central stations, electric railway, electrified railroad, public works and other plants generating energy for public use

These statistics relate to **all** plants (not exclusively to central stations) having an output of 10,000 kw.-hr. per month, comprised in the totals reported each month, formerly by the U. S. Geological Survey, since July, 1936, by the F. P. C.

Year	Energy Generated from Fuel† (Millions of Kw.-Hr.)	Fuel Consumed			Coal Plus Coal Equivalent of Oil and Gas (Millions of Tons)	Pounds of Coal per Kw.-Hr.†
		Coal (Millions of Tons)	Oil (Millions of Bbl.)	Gas (Billions of Cu. Ft.)		
1919...	24,175	35.10	11.05	21.41	38.88	3.2
1924...	38,808	37.56	16.63	48.44	43.13	2.2
1929...	62,284	44.94	10.12	112.71	52.57	1.69
1930...	62,514	42.90	9.26	120.29	50.65	1.62
1931...	60,768	38.73	8.12	139.33	47.13	1.55
1932...	48,931	30.29	7.97	107.88	36.60	1.50
1933...	50,542	30.58	9.94	102.60	37.16	1.47
1934...	56,914	33.56	10.38	127.90	41.27	1.47
1935...	59,176	34.81	11.39	125.24	43.19	1.46
1936...	72,665	42.03	14.12	156.08	51.99	1.44
1937...	77,348	44.77	14.14	171.27	55.14	1.43
1938*..	71,584	40.20	13.40	168.86	50.42	1.42

* Ten months actual, two months estimated. † Output by use of wood not included.

AVE. HOURS USE OF GEN. CAPACITY



ENERGY SALES

Eighteen per cent Drop in Industrial Brings Total Down 6 Billion Kw.-Hr. — Stabilizing Effect of Residential Usage

TODAY, with weekly outputs for the public utility industry reaching new highs for all time, it may appear to be somewhat academic to interpret the declines in total sales which marked the past year.

Upon closer inspection, however, of the components which make up the sales total, it will be noted that all of the important classifications registered increases over 1937, with the major exception of commercial large light and power, sometimes characterized as industrial. The 17.7 per cent drop of 9.5 billion kw.-hr. in this classification alone was more than enough to account for the decrease of 6 billion kw.-hr. shown in total sales for 1938.

The vigor of the industry's growth is attested anew by noting that total sales in 1938 of 93.4 billion kw.-hr., even with industrial sales included, exceeded 1929 by the wide margin of 24 per cent. Furthermore, during the "industrial pause" of 1938, the residential sales increased 10.1 per cent to 18.6 billion kw.-hr., farm sales increased 5.5 per cent to 2.5 billion kw.-hr., commercial small light and power sales increased 5.4 per cent to 18.5 billion kw.-hr. and sales to electrified divisions of steam railroads increased 12.2 per cent to 1.4 billion kw.-hr.

In brief, if it were not for commercial large light and power sales, then 1938 sales would have exceeded 1937 by 7.5 per cent.

The drop in energy sales from the peak week in September, 1937, through April last year was the most precipitous the industry has ever experienced. As has been stated, this was entirely due to lower wholesale customer use.

The largest previous drop in any one year occurred in 1932 and amounted to only two-thirds of the above, or 6 billion kw.-hr. On the other hand, residential use showed the largest volume of gain of any year except 1937.

The effect of these two opposite trends, one in the lowest rate classification and the other in the highest, was to bring the revenue for the year approximately to last year's level. The two circles on the opposite page show this clearly. Residential customers used only 19.9 per cent of the energy sold, but gave the utilities some 36.1 per cent of the revenue. Large wholesale commercial customers, on the other hand, absorbed 47.2 per cent of the energy sold, but gave only 25 per cent of the revenue. This situation was further helped by the retail commercial customers with approximately the same usage as residential, but at somewhat lower average rates, accounting for 28.3 per cent of revenue.

Only three times before, in the last twenty years at least, has residential accounted for a larger percentage of the gross, and that was in 1933, 1934, 1935, the peak being 36.5 per cent. Under normal conditions, it is around 31 to 32 per cent. During poor business conditions the residential ratio increases and aids revenue stability.

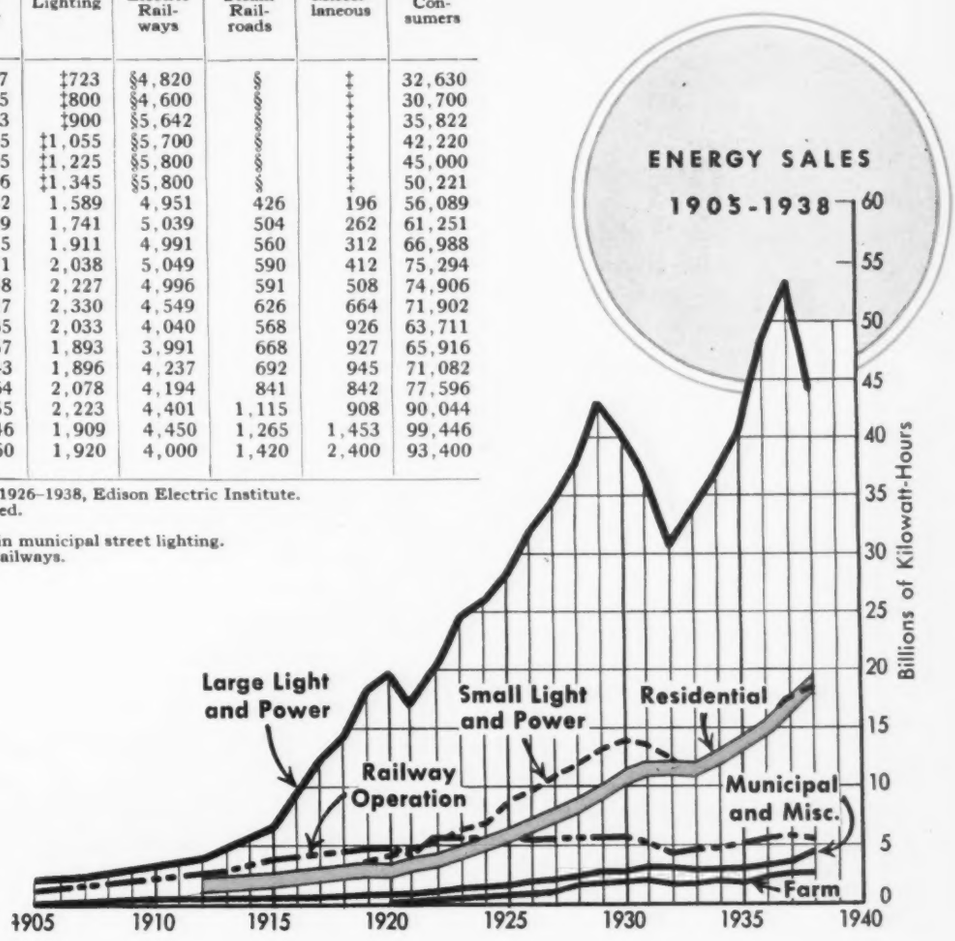
The trend of the output curve would indicate that this situation would be materially changed in 1939. Industrial load is coming back fast and will cause a sharp uprise in energy sales. Revenue, however, cannot be expected to rise as fast.

On the other hand, substantial improvement in the rate of growth of residential usage can be expected as the result of increased home building and more employment. Farm usage will also increase, but probably not so fast, due to reduced construction budgets on the part of private companies for new farm lines.

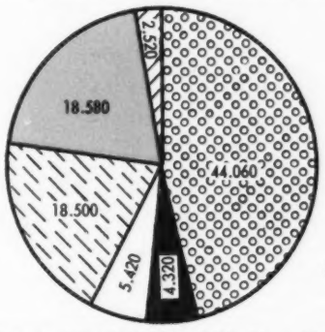
ENERGY SALES TO ULTIMATE CONSUMERS
in Millions of Kw.-Hr.

Year	Farm	Residential	Commercial Small Light and Power	Commercial Large Light and Power	Municipal Street Lighting	Street and Interurban Electric Railways	Electrified Divisions of Steam Railroads	Municipal and Miscellaneous	Total to Ultimate Consumers
1920	†	†2,950	4,140	19,997	‡723	§4,820	§	‡	32,630
1921	†	†3,215	4,850	17,235	‡800	§4,600	§	‡	30,700
1922	†	†3,670	5,207	20,403	‡900	§5,642	§	‡	35,822
1923	†	†4,420	6,380	24,665	‡1,055	§5,700	§	‡	42,220
1924	†	†5,070	7,010	25,895	‡1,225	§5,800	§	‡	45,000
1925	†	†5,930	8,850	28,296	‡1,345	§5,800	§	‡	50,221
1926	723	6,727	9,485	31,992	1,589	4,951	426	196	56,089
1927	861	7,538	10,766	34,539	1,741	5,039	504	262	61,251
1928	1,387	8,420	11,692	37,715	1,911	4,991	560	312	66,988
1929	1,602	9,526	13,106	42,971	2,038	5,049	590	412	75,294
1930	1,789	10,703	13,944	40,148	2,227	4,996	591	508	74,906
1931	1,879	11,373	13,544	36,937	2,330	4,549	626	664	71,902
1932	1,579	11,494	12,106	30,965	2,033	4,040	568	926	63,711
1933	1,633	11,358	11,589	33,857	1,893	3,991	668	927	65,916
1934	1,858	12,233	12,278	36,943	1,896	4,237	692	945	71,082
1935	1,693	13,496	13,588	40,864	2,078	4,194	841	842	77,596
1936	2,138	14,992	15,612	48,655	2,223	4,401	1,115	908	90,044
1937	2,389	16,875	17,558	53,546	1,909	4,450	1,265	1,453	99,446
1938 *	2,520	18,580	18,500	44,060	1,920	4,000	1,420	2,400	93,400

Sources: 1920–1925, *Electrical World*· 1926–1938, Edison Electric Institute.
* Ten months actual, two months estimated.
† Farm included with residential.
‡ Municipal and miscellaneous combined in municipal street lighting.
§ Electrified railways combined in street railways.



ENERGY USE BY CLASSES OF CONSUMERS

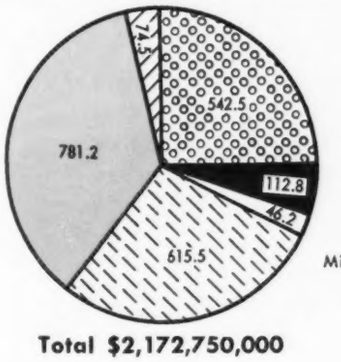


Total 93,400,000,000 Kw.-Hr.

Millions of Kw.-Hr.

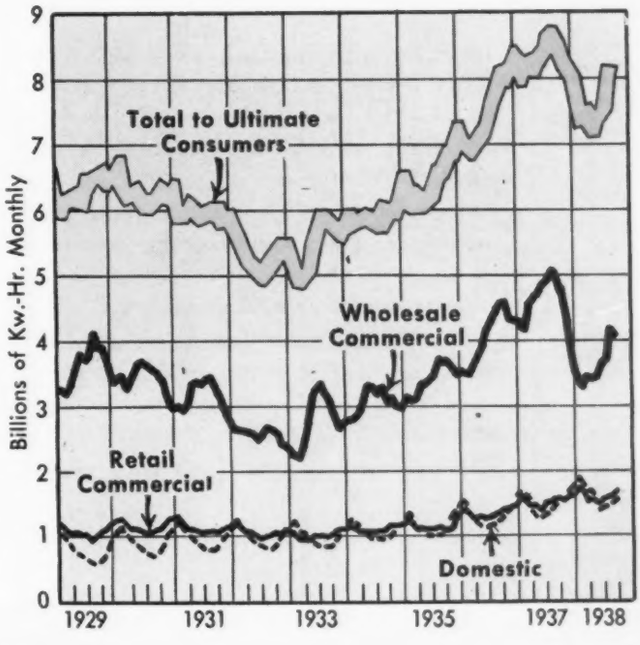
Farm
Residential
Small Light & Power
Large Light & Power
Elec. Railways
Municipal & Misc.

REVENUE BY CLASSES OF CONSUMERS



Millions of Dollars

Total $2,172,750,000



REVENUE

Total of 2.2 Billion Approximately the Same as 1937—Loss in Industrial Billings Offset by Gains in Others

ONE of the most remarkable aspects of the public utility industry during 1938 was its ability to sell a sufficient number of kilowatt-hours of electric service in each of the major classifications to maintain gross revenues at last year's peak levels.

During the past twelve months utility customers bought $2,172,750,000 of electric service, an amount which does not vary as much as four-tenths of 1 per cent from the previous year.

The manner in which this extreme stability was maintained in one of the nation's largest industries is also of great interest.

A study of the three important sources of gross revenue, residential, commercial small light and power and commercial large light and power, shows first of all that 1938 took a toll of some $73,000,000 in the third, or industrial, classification. These revenues dropped back almost to the levels of 1935, canceling—at least temporarily—the growth since that time. Nevertheless, while the severity of this drop has been paralleled only once before (in 1932), the 1938 drop of 11.9 per cent was one half the 20.8 per cent drop in 1929-1933.

How this $73,000,000 drop was compensated for, to hold total gross practically intact, is seen principally in the $41,000,000 increase in residential revenue, the $11,000,000 increase in commercial revenue and the $7,000,000 increase in farm revenue, and an $8,500,000 increase in the general municipal and miscellaneous revenues, which, it should be noted, resulted in part from a change in classification.

With respect to the three principal classifications, there is an important long-term trend to be noted. A decade ago the public utility industry was deriving roughly a half billion dollars a year from each of the three major sources of revenue, residential, commercial and industrial.

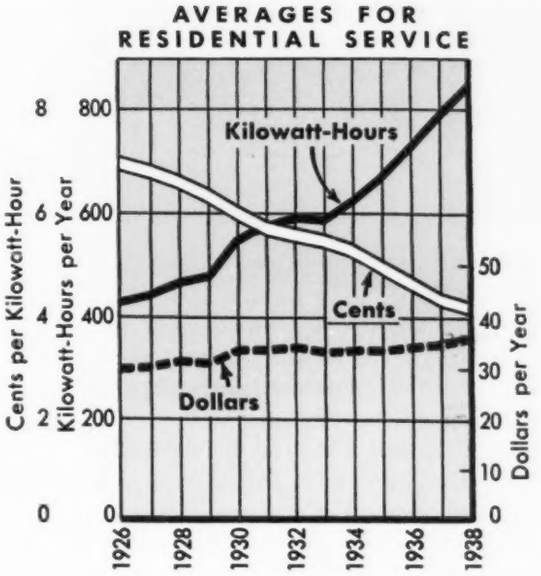
Ten years afterward, after all the ups and downs of general business, industrial business has been developed so industrial revenue has held its own, and, despite the 1938 drop, totaled $542,000,000; commercial revenues have been steadily advanced year after year since 1933 to something over $600,000,000, and residential revenues —climbing on an ascending scale since 1933 —are within striking distance of $800,000,000. In fact, if farm revenues of $74,500,000 are added, the total home and farm revenues of $855,700,000 represent an increase in five years of 27.6 per cent, or $185,402,000.

The enormous significance of this *increase* in revenue in five short years may be better appraised by considering it as sufficient to pay half the fixed charges.

Street-lighting revenues continued their long-term tendency to subside gradually to lower levels. This year, however, the industry was able to reverse this trend in kilowatt-hour sales. Sales were up only 1 per cent, but the change in the direction from down to up may be an augury of better street-lighting business to come.

This year the average residential bill continued its upward march to a new high of $35.70—still less than 10 cents per day. Since the turn in 1933, the average bill has increased 9.65 per cent, but in paying this increased bill the customer bought 43.4 per cent more kilowatt-hours. The average rate was at a new low of 4.2 cents.

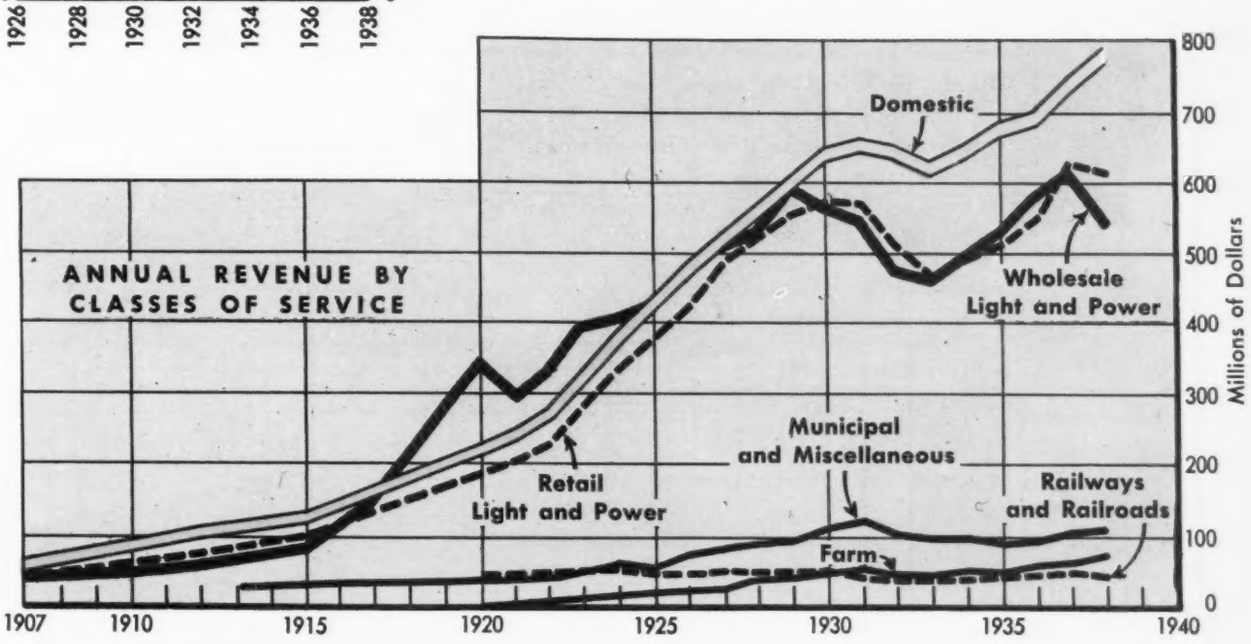
The industry should note well that since 1933 all new residential kilowatt-hours were sold for only 1.22 cents, but last year they were sold for 1.51 cents and, for the second year, are pointed in the direction which means safety for the industry.



RESIDENTIAL SERVICE
to Urban and Non-Farm Homes

Year	Kw.-Hr. per Customer	Average Annual Bill (Dollars)	Revenue per Kw.-Hr. (Cents)
1926	428	29.87	6.98
1927	444	30.19	6.80
1928	460	30.36	6.60
1929	499	31.44	6.30
1930	543	32.58	6.00
1931	578	33.18	5.74
1932	597	33.25	5.57
1933	595	32.67	5.49
1934	624	33.07	5.30
1935	672	33.53	4.99
1936	727	33.81	4.65
1937	793	34.81	4.39
1938*	850	35.70	4.20

(E.E.I.) * Ten months actual, two months estimated.



REVENUE FROM ULTIMATE CONSUMERS (in Thousands of Dollars)

Year	Farm	Residential	Commercial Small Light and Power	Commercial Large Light and Power	Municipal Street Lighting	Street and Interurban Electric Railways	Electrified Divisions of Steam Railroads	Municipal and Miscellaneous	Total Revenue from Ultimate Consumers
1920	†	†223,500	185,400	337,500	‡39,320	§42,000	§	‡	827,720
1921	†	†246,400	204,100	295,000	‡43,500	§44,650	§	‡	833,650
1922	†	†275,890	231,888	334,788	‡49,151	§50,750	§	‡	942,467
1923	†	†323,000	276,800	393,000	‡54,750	§52,200	§	‡	1,099,750
1924	†	†381,400	331,000	402,000	‡60,700	§54,400	§	‡	1,229,500
1925	†	†422,000	372,000	423,000	‡58,700	§53,270	§	‡	1,328,970
1926	21,637	469,272	427,407	476,187	68,023	47,617	4,372	5,641	1,520,159
1927	25,329	512,329	482,135	504,488	77,248	47,965	5,172	5,747	1,661,032
1928	36,540	555,894	519,957	529,173	83,024	46,488	5,559	7,670	1,784,309
1929	40,665	600,265	555,640	591,038	88,323	46,277	5,986	10,322	1,938,520
1930	46,689	642,275	575,598	566,467	95,458	46,067	6,015	12,382	1,990,955
1931	50,726	653,282	564,523	544,728	99,298	41,912	6,725	14,746	1,975,944
1932	47,127	640,384	500,993	474,424	89,828	36,701	6,181	18,076	1,813,717
1933	46,501	623,797	471,780	468,389	83,097	35,098	6,658	19,243	1,754,366
1934	49,182	648,801	490,420	499,451	81,846	36,402	6,680	19,085	1,831,870
1935	48,404	673,526	519,213	531,106	79,429	36,431	7,944	15,933	1,911,988
1936	59,286	696,997	562,122	581,148	80,791	37,423	9,591	17,225	2,044,586
1937	67,947	740,219	604,848	615,049	74,200	37,542	10,671	30,312	2,180,788
1938*	74,500	781,200	615,500	542,500	74,000	34,400	11,850	38,800	2,172,750

Sources: 1920–1925, *Electrical World*, estimated allocations; 1926–1938, Edison Electric Institute.
* Ten months actual, two months estimated.
† Farm included with residential.
‡ Municipal and miscellaneous combined in municipal street lighting.
§ Electrified railroads combined with street railways.

CUSTOMERS

Total 27,700,000 as Result of Adding 600,000 New — Every Classification Shows Increase — Farm Customers Up Nearly 14 per cent

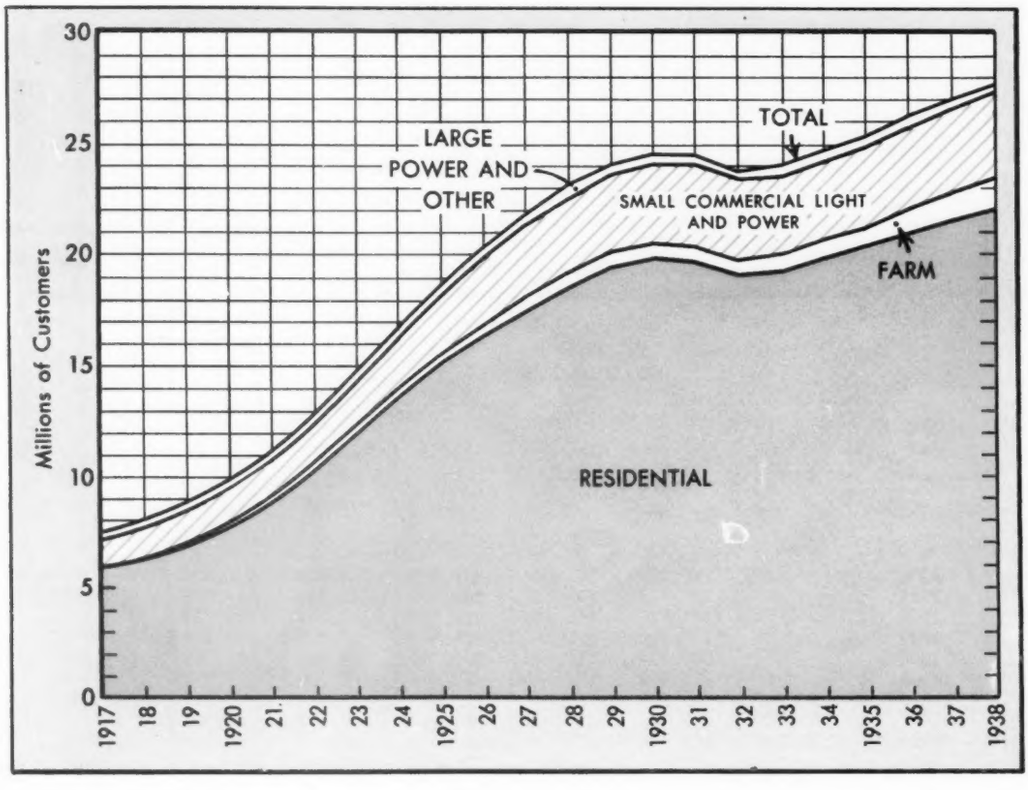
AGAIN in 1938 the public utility industry continued its uninterrupted rise in total number of customers connected, reaching a total of 27,765,480, which was 601,493 above the figure of a year ago. Despite the increased unemployment and generally unsettled business situation which prevailed during a large portion of 1938 the industry connected to its lines approximately three-fourths the 794,121 customers attached in the more prosperous year of 1937.

It is interesting to note that in every classification more new customers were added last year than in 1937 with the one exception of residential. New residential customers were some 312,000, or approximately one-half as many as were added in the previous year. Obviously protracted unemployment was responsible for this situation.

Farm customers at the end of 1938 totaled 1,400,000, an increase of 13½ per cent. The number of commercial customers increased 2 per cent and wholesale power, which declined in 1937, reversed the trend strangely enough, increasing by about 10,000.

It is also interesting to note an increase in the number of miscellaneous customers of some 40 per cent, due to approximately 30,000 new public authority customers.

See page 100 for further data.



CENTRAL STATION CUSTOMERS at End of Year

Regional or State	Total Number			Farms Served			Residential			Commercial Lighting and Small Power			Wholesale Power		Municipal, Rail and Miscellaneous	
	1937	1938*	Change in 1938	1937	1938*	Change in 1938	1937	1938*	Change in 1938	1937	1938*	Change in 1938	1937	1938*	1937	1938*†
UNITED STATES	**27,163,987**	**27,765,480**	**601,493**	**1,241,505**	**1,410,000**	**168,495**	**21,697,515**	**22,010,000**	**312,485**	**3,891,584**	**3,972,000**	**80,416**	**259,678**	**270,000**	**73,705**	**103,480**
NEW ENGLAND	**2,402,102**	**2,428,237**	**26,135**	**79,274**	**84,400**	**5,126**	**1,973,640**	**1,987,500**	**13,860**	**306,643**	**311,300**	**4,657**	**37,272**	**38,600**	**5,273**	**6,437**
Maine	208,792	221,600	12,808	16,765	18,200	1,435	156,950	165,900	8,950	30,475	30,000	—475	3,053	5,400	1,549	2,100
New Hampshire	135,479	141,819	6,340	9,718	10,000	282	104,891	110,300	5,409	16,258	16,800	542	3,079	3,000	1,533	1,719
Vermont	88,252	90,421	2,169	7,572	9,800	2,228	65,221	64,800	—421	12,497	12,800	303	2,330	2,400	632	621
Massachusetts	1,282,785	1,286,289	3,504	21,359	21,400	41	1,074,065	1,077,300	3,235	169,021	170,300	1,279	16,939	15,700	1,401	1,589
Rhode Island	199,708	195,945	—3,763	3,860	4,000	140	169,011	165,700	—3,311	23,510	22,700	—810	3,285	3,300	42	245
Connecticut	487,086	492,163	5,077	20,000	21,000	1,000	403,502	403,500	—2	54,882	58,700	3,818	8,586	8,800	116	163
MIDDLE ATLANTIC	**7,393,020**	**7,519,911**	**126,891**	**192,145**	**206,200**	**14,055**	**6,038,539**	**6,131,800**	**93,261**	**1,079,154**	**1,101,700**	**22,546**	**66,157**	**59,700**	**17,025**	**20,511**
New York	3,897,060	3,921,350	24,290	87,787	90,500	2,713	3,176,420	3,195,800	19,380	584,230	590,900	6,670	41,395	34,600	7,228	9,550
New Jersey	1,207,842	1,243,892	36,050	19,722	21,200	1,478	988,703	1,021,500	32,797	194,475	195,100	625	2,957	3,000	1,985	3,092
Pennsylvania	2,288,118	2,354,669	66,551	84,636	94,500	9,864	1,873,416	1,914,500	41,084	300,449	315,700	15,251	21,805	22,100	7,812	7,869
EAST NORTH CENTRAL	**6,469,634**	**6,568,702**	**99,068**	**340,550**	**401,400**	**60,850**	**5,228,801**	**5,241,700**	**12,899**	**839,980**	**862,300**	**22,320**	**43,431**	**40,600**	**16,872**	**22,702**
Ohio	1,773,382	1,756,303	—17,079	92,595	105,300	12,705	1,437,395	1,396,800	—40,595	225,995	234,100	8,105	13,462	11,700	3,935	8,403
Indiana	772,696	792,446	19,750	51,582	67,200	15,618	607,088	604,100	—2,988	101,595	107,500	5,905	7,992	8,700	4,439	4,946
Illinois	1,966,877	1,991,916	25,039	51,865	58,800	6,935	1,646,725	1,661,000	14,275	252,088	254,900	2,812	11,387	11,900	4,812	5,316
Michigan	1,247,498	1,296,105	48,607	84,031	103,400	19,369	998,107	1,021,700	23,593	160,744	165,000	4,256	3,358	4,300	1,258	1,705
Wisconsin	709,181	731,932	22,751	60,477	66,700	6,223	539,486	558,100	18,614	99,558	100,800	1,242	7,232	4,000	2,428	2,332
WEST NORTH CENTRAL	**2,562,433**	**2,612,165**	**49,732**	**120,459**	**138,200**	**17,741**	**2,005,124**	**2,027,400**	**22,276**	**414,854**	**421,900**	**7,046**	**14,062**	**14,745**	**7,934**	**9,920**
Minnesota	536,830	544,457	7,627	17,980	22,300	4,320	422,116	424,300	2,184	93,195	93,300	105	1,936	2,500	1,603	2,057
Iowa	508,811	522,486	13,675	39,651	45,400	5,749	393,838	400,400	6,562	71,675	73,100	1,425	2,527	2,300	1,120	1,286
Missouri	738,142	731,263	—6,879	25,860	29,200	3,340	593,424	583,400	—10,024	113,704	112,800	—904	3,800	4,200	1,354	1,663
North Dakota	79,863	81,527	1,664	3,277	3,300	23	56,494	58,000	1,506	19,175	19,000	—175	388	670	529	557
South Dakota	89,916	95,832	5,916	3,321	3,600	279	68,531	74,100	5,569	17,498	17,600	102	162	125	404	407
Nebraska	251,865	256,113	4,248	12,583	15,400	2,817	195,346	194,400	—946	40,970	44,300	3,330	2,080	900	886	1,113
Kansas	357,006	380,487	23,481	17,787	19,000	1,213	275,375	292,800	17,425	58,637	61,800	3,163	3,169	4,050	2,038	2,837
SOUTH ATLANTIC	**2,239,575**	**2,343,204**	**103,629**	**123,542**	**155,200**	**31,658**	**1,769,294**	**1,826,700**	**57,406**	**325,641**	**335,600**	**9,959**	**14,433**	**16,480**	**6,665**	**9,224**
Delaware	53,712	57,245	3,533	2,788	3,000	212	41,706	44,600	2,894	8,685	8,900	215	277	500	256	245
Maryland, Dist. of Columbia	542,766	556,265	13,499	16,666	17,600	934	448,837	459,100	10,263	75,000	77,100	2,100	1,752	1,850	511	615
Virginia	334,256	350,188	15,932	22,986	26,400	3,414	258,693	270,200	11,507	48,460	47,700	—760	3,553	4,400	564	1,488
West Virginia	237,849	251,926	14,077	10,629	14,600	3,971	190,945	196,500	5,555	34,311	37,600	3,289	1,664	1,750	300	1,476
North Carolina	342,410	377,682	35,272	32,192	37,100	4,908	268,096	295,200	27,104	37,207	40,000	2,793	3,241	3,700	1,674	1,682
South Carolina	140,332	148,471	8,139	14,171	19,000	4,829	102,719	105,800	3,081	21,413	21,400	—13	1,343	1,550	686	721
Georgia	280,442	293,034	12,592	16,521	27,500	10,979	209,611	209,800	189	52,804	54,100	1,296	1,018	1,060	488	574
Florida	307,808	308,393	585	7,589	10,000	2,411	248,687	245,500	—3,187	47,761	48,800	1,039	1,585	1,670	2,186	2,423
EAST SOUTH CENTRAL	**965,686**	**1,012,213**	**46,527**	**66,632**	**79,600**	**12,968**	**729,515**	**758,200**	**28,685**	**155,418**	**158,000**	**2,582**	**9,541**	**10,900**	**4,580**	**5,513**
Kentucky	308,901	318,871	9,970	13,603	16,900	3,297	243,980	248,600	4,620	44,122	44,300	178	5,057	6,400	2,139	2,671
Tennessee	305,757	321,348	15,591	25,079	27,400	2,321	230,714	242,000	11,286	47,212	49,100	1,888	1,820	1,740	932	1,108
Alabama	232,346	244,300	11,954	20,938	27,800	6,862	170,236	175,500	5,264	39,711	39,300	—411	1,053	1,060	408	640
Mississippi	118,682	127,694	9,012	7,012	7,500	488	84,585	92,100	7,515	24,373	25,300	927	1,611	1,700	1,101	1,094
WEST SOUTH CENTRAL	**1,534,403**	**1,603,223**	**68,820**	**59,544**	**67,000**	**7,456**	**1,179,474**	**1,230,600**	**51,126**	**258,532**	**264,400**	**5,868**	**26,404**	**30,015**	**10,449**	**11,208**
Arkansas	139,604	150,468	10,864	7,559	9,000	1,441	100,827	108,600	7,773	27,333	28,400	1,067	2,236	2,900	1,649	1,568
Louisiana	249,473	257,926	8,453	8,008	8,400	392	198,477	204,800	6,323	39,423	40,400	977	2,174	2,900	1,391	1,426
Oklahoma	303,454	319,944	16,490	12,772	15,400	2,628	226,674	239,300	12,626	51,363	51,000	—363	10,772	11,815	1,873	2,429
Texas	841,872	874,885	33,013	31,205	34,200	2,995	653,496	677,900	24,404	140,413	144,600	4,187	11,222	12,400	5,536	5,785
MOUNTAIN	**742,169**	**787,219**	**45,050**	**65,944**	**71,800**	**5,856**	**555,325**	**587,700**	**32,375**	**105,858**	**106,700**	**842**	**13,788**	**16,860**	**1,254**	**4,159**
Montana	105,080	102,482	—2,598	4,582	5,000	418	82,540	80,200	—2,340	17,216	15,200	—2,016	573	900	169	1,182
Idaho	102,327	107,933	5,606	20,109	22,400	2,291	67,537	70,400	2,863	14,177	13,400	—777	363	600	141	1,133
Wyoming	39,707	42,400	2,693	1,993	2,300	307	30,231	32,200	1,969	6,364	6,500	136	1,054	1,310	65	90
Colorado	223,917	240,560	16,643	9,625	12,200	2,575	176,194	186,700	10,506	29,397	31,100	1,703	8,496	10,250	205	310
New Mexico	45,100	46,713	1,613	2,100	2,300	200	33,146	34,500	1,354	9,137	9,300	163	572	470	145	143
Arizona	78,998	93,901	14,903	6,890	7,200	310	59,011	72,000	12,989	12,333	13,400	1,067	490	970	274	331
Utah	123,327	128,470	5,143	19,369	19,100	—269	88,986	93,100	4,114	12,681	13,400	719	2,105	2,000	186	870
Nevada	23,713	24,760	1,047	1,276	1,300	24	17,680	18,600	920	4,553	4,400	—153	135	360	69	100
PACIFIC	**2,854,965**	**2,890,606**	**35,641**	**193,415**	**206,200**	**12,785**	**2,217,803**	**2,218,400**	**597**	**405,504**	**410,100**	**4,596**	**34,590**	**42,100**	**3,653**	**13,806**
Washington	471,778	490,655	18,877	47,045	52,300	5,255	362,453	371,300	8,847	59,134	63,300	4,166	2,349	1,900	797	1,855
Oregon	277,573	287,678	10,105	29,016	33,900	4,884	205,925	206,900	975	38,583	43,700	5,117	2,945	1,900	1,104	1,278
California	2,105,614	2,112,273	6,659	117,354	120,000	2,646	1,649,425	1,640,200	—9,225	307,787	303,100	—4,687	29,296	38,300	1,752	10,673

* Estimate based on first ten months of the year.

† Includes in 1938 other Public Authorities.

RATE REDUCTIONS

IS THE heavy period of utility rate slashing past? There are some indications that such might be the case.

Reports from thirty state regulatory commissions gave a total of 31.6 millions saved by customers in 1936 through lower rates, 48.7 millions in 1937 and 16.1 millions in 1938. Because the states are not identical the totals are not exactly comparable. The figures for corresponding states are, nevertheless, extremely heartening to utility management.

A slowing up in rate reductions is not only indicated here but is in line with what might reasonably be expected. Certainly it is not going to be possible to continue to increase expenses, pay higher taxes and at the same time lower rates. In fact, it would not be surprising shortly to learn of utilities seeking relief through higher rates.

The residential customer paid on the average last year 1.9 mills less per kilowatt-hour than in 1937, or in the aggregate 35 millions less than would have been paid at the 1937 average rate. How much of this was due to rate reductions and how much to higher usage in the lower brackets is not known. However, partial figures for 1937 showed that a little over 40 per cent of the savings from rate reductions benefited the residential customer. Using that average and only such data as are here shown, it will be found that something more than 25 per cent of the 35 million savings resulted from rate reduction. If complete data were available it is conceivable that this figure might go as high as 40 per cent.

In any event, it is evident that the constant load-building campaign with low rates for higher usage, which is responsible for the other 60 per cent or more, is considerably more effective in providing cheap electric service than rate reductions.

The information that residential rate reductions presented as 40% of all the savings came somewhat as a surprise, for it is generally accepted that the figure has been much larger. The data, however, were for 1937 from seventeen states that represent probably 70 per cent of the total.

The total reduction was 34 millions, broken down into residential 13.5 millions, commercial 11.9, industrial 6.9 and miscellaneous 1.7 millions of dollars.

The commercial revenue is some 20 per cent less than residential, yet the volume of rate reductions is only 12 per cent less. It would appear, therefore, from these figures that rates for commercial service certainly were not being neglected by the commissions.

ANNUAL SAVINGS TO CUSTOMERS

As Reported by the Several State Commissions

State	1935	1936	1937	1938
Alabama[a]	.....	$219,680	$521,182	$390,495
Arkansas	$385,840	85,640	57,806	371,537
California	.....	5,418,318*	4,891,362*	353,382*
Colorado[b]	.....	222,500	150,000	130,000
Connecticut	.....	1,114,683	710,104[c]	1,398,624[a]
District of Columbia	.....	310,755	504,682	770,080
Georgia	.....	235,240	870,490	172,660
Idaho	.....	115,800	172,760	190,550
Illinois	1,326,209	4,388,814	1,921,571	1,774,119
Indiana	.....	533,803	857,156	1,360,298
Kansas	.....	.....	363,900	137,370
Kentucky	.....	1,037,042	726,744	350,380[d]
Louisiana	.....	96,715	85,030	449,893
Maine	.....	377,894*	311,880*	174,650*
Maryland	285,242	1,102,545	419,137	80,000
Massachusetts	.....	1,263,022	2,052,086	.....
Missouri[b]	.....	.....	1,292,518	1,177,334
New Hampshire	497,647	93,944	60,472	190,390[d]
New Jersey	.....	47,149	2,129,032	1,844,245
New York	13,161,000	1,733,000	8,601,900	.....
North Carolina	.....	7,103,203	9,487,403	.....
Oregon	58,902	266,870	529,899	137,306[d]
Pennsylvania	.....	1,677,607	8,827,680	3,017,526
Rhode Island	.....	611,530	36,725	5,000[e]
South Carolina	.....	757,357	259,223	422,074[d]
Vermont	.....	39,301	94,287	46,180[d]
Virginia	.....	892,900	391,400	550,300
Washington	402,674	370,245	311,042	25,267
West Virginia	.....	456,892*	901,916*	98,418*
Wisconsin	.....	1,043,047	1,174,472	481,012[d]
Total	.....	$31,615,496†	$48,713,859†	$16,099,090†

* Fiscal year ending June 30 or July 1. † Totals not comparable, not embracing identical States. *a* Year Sept. 30. *b* Year Nov. 30. *c* Nine months. *d* Year incomplete. *e* Rate activities suspended pending valuation.

MUNICIPAL OWNERSHIP

PUBLIC ownership in many respects appeared to make more progress in 1938 than in any single previous year, yet the totals upon analysis do not form an impressive aggregate.

PWA allocated funds in the form of grants or loans, or both, to some 161 communities last year. Of these, 104 were already served in whole or in part by municipal plants, 50 were being served by private utilities and six had not previously been served. These were in addition to appropriations to Nebraska power districts. Outside the latter allocation the population affected was only 2,040,719, of which but 248,000 was in places being served by private utilities.

During the year several private utilities threatened by government competition sold properties to the local governments. In the TVA area, Tennessee Public Service to Knoxville, Kentucky — Tennessee Light & Power to 28 towns in Tennessee, West Tennessee Light & Power to four cities. In Nebraska the Iowa-Nebraska Light & Power. Other reported sales are at Flandreau, S. D.; Schullsburg, Wis.; Tucumcari, N. M., and Seaford, Del.

On the other side of the picture is the growing percentage of elections where public ownership was defeated. The list of such places is incomplete, but there is a record of thirty-one instances where municipalities refused actual PWA loans and grants and in another sixteen places of record, proposals involving PWA money were turned down. The gratifying element in this connection is that of the total of 47 instances involving federal aid 31, or nearly 70 per cent, were the decisions of voters. The others were decided by the mayor or council. On eighteen such projects where complete data were available the total amount of the projects involved was 11 millions. Of this PWA had offered to give outright 5 millions—and still they were turned down.

In the Northwest, where Bonneville power is available, although the balloting was close, half the districts voting voted against public ownership. Oklahoma rejected a bond proposal to facilitate municipal utility undertakings.

There are two factors which should operate to reduce materially municipal ownership in 1939. One is the temper of the voters, as shown in the data above, and the other is the probability that Congress will appropriate no further funds for PWA loans and grants for this purpose.

The only thing that has kept municipal ownership agitation alive this past year has been the availability of federal loans and grants.

Nevertheless, a continued drive for private company territory can be expected from large federal water power projects as the only quick way to dispose of power in areas that otherwise would provide no substantial market for years. On the assumption that the Supreme Court does not upset the lower court in the TVA case, it is certain that pressure will continue to be exerted by those in charge of TVA, Bonneville, Lower Colorado and Platte River, to force this use of government-generated power in communities now privately served. How such activities will be financed is not clear, but the action in Nebraska might be indicative.

P. W. A.—FINANCED ELECTRIC POWER PROJECTS—1938

Geographic Region	Population Affected	Number of Projects	Loan	Grant	Estimated Cost
New England	31,629	2	.....	$361,490	$803,309
Middle Atlantic	25,243	4	.....	269,185	598,355
East North Central	1,197,829	38	$66,000	6,104,240	14,100,398
West North Central	273,478	50	4,361,000	7,696,269	17,119,277
South Atlantic	190,598	13	268,000	2,006,699	4,457,664
East South Central	102,376	14	296,025	1,738,888	3,866,088
West South Central	169,222	33	964,000	1,605,117	3,571,605
Mountain	50,344	7	.....	557,524	1,246,313
Pacific	.....	0	.....	.....	.....
U. S. Total	**2,040,719**	**161**	**$5,955,025**	**$20,339,412**	**$45,763,009**

EXPENSES

Operating Ratio Constant — Taxes Up to 16.7 per Cent — Average Wage Increased 2 per Cent — Maintenance Higher

ANOTHER skillful year of management of the private electric utilities has held the operating ratio close to the level prevailing through the preceding six crucial years. This has been done in the face of rising costs and lowered rates in full realization that if it were not done the ominously rising taxes would encroach disastrously on the margin available for payment for rent of capital. For the last three years it has stood above 37.0 per cent, slowly moving upward from the 35 and 36 per cent values maintained in the earlier years of the decade. With costs of fuel and supplies and labor tending upward, it took careful planning to repeat in 1938 the 37.7 per cent figure of 1937.

Add a tax bill of 16.7 per cent and the operating ratio is elevated to a new high of 53 per cent. Six years ago this figure was 47.7 per cent. Fortunately, interest rates are down, otherwise the decline from 52.3 to 45.6 in funds available for rental of capital would hardly suffice to keep the industry in sufficiently commanding position to obtain the benefits of the lower prevailing interest rates.

Citation of the more favorable interest rates for refunding as a justification for lowered rates for service thus overlooks the fact that rising taxes take up all the differential that would accrue from this beneficial circumstance. As a matter of fact, the enlarged tax bill also absorbs most of the technological savings in operation.

For every $100 the private industry received from sale of energy there was $16.70 that went for taxes and (taking private and governmental together) $17.35 to the employees. Each electric customer is contributing just about as much in each electric bill to keep government nourished as he is for the wages of the employees who serve him his electricity. What other industry outside the tobacco, liquor and luxury group is comparable as a tax gatherer?

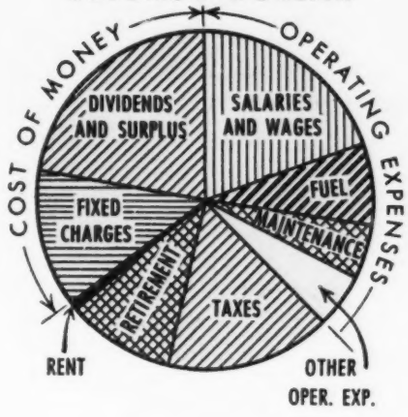
A few less (2.75 per cent) employees were engaged in the business of delivering 5 per cent less energy for 0.3 per cent less total operating revenue than in 1937. But those 274,000 employees averaged $1,468 each in annual wage or salary. In 1937 the 282,000 employees received an overage of $1,435, showing that the industry, while not curtailing employment in anything like the degree of other industries in a relatively poor year of business, actually paid a 2 per cent increase in wages. As a whole, the industry has within 5.2 per cent as many employees as in 1929, a year of large field forces for construction and plant erection.

Expenditures for maintenance for the entire industry in 1938, including municipally as well as privately owned properties, amounted to $116,000,000. This was 5.4 per cent of revenue from ultimate consumers and represents 8 mills per dollar of the $14,200,000,000 investment.

Only in 1933 did the industry recede in its outlay for maintenance, as is shown in the tabulation for privately owned utilities. Otherwise, in each of the last seven years there was an increased amount allocated to the upkeep of the property.

Put operating expenses (including wages and maintenance) and taxes and depreciation together and the residue is what is left for the investor. It may not be encouraging to him to note that while total operating revenues dropped $7,000,000 below 1937, the amount available for interest and dividends dropped $15,000,000 to a three-year low of $712,000,000, but the fact remains that it is black and not red ink.

ALLOCATION OF REVENUE DOLLAR



WAGES, COST OF FUEL MAINTENANCE

Private Electric Light and Power Industry

Year	Millions of Dollars		
	Salaries and Wages	Fuel	Maintenance
1932	303	97	84
1933	310	97	80
1934	329	116	89
1935	349	125	96
1936	360*	156	100
1937*	379	168	103*
1938*	376	156	109

* Estimated. Other years from E.E.I.

INCOME AND EXPENDITURES

Private Electric Light and Power Industry
Edison Electric Institute, Intercompany transactions eliminated

	Millions of Dollars						
	1932	1933	1934	1935	1936	1937*	1938†
Operating Revenue (Elec.)							
From ult. consumers	1,696	1,637	1,706	1,777	1,903	2,015	2,008
Sales to mun. systems	16	15	15	16	18	19	19
Miscellaneous	7	12	15	20	20	21	21
Total oper. revenue	1,719	1,664	1,736	1,813	1,941	2,055	2,048
Rev. Deductions (Elec.)							
Operating Expenses							
Production	Data	180	201	217	252	.....	.....
Trans. and dist	not re-	136	146	152	153	.....	.....
Utilization	quest-	32	34	33	35	.....	.....
Commercial[a]	ed	86	83	81	82	.....	.....
New business	from	33	39	47	57	.....	.....
General and misc	com-	131	133	139	146	.....	.....
	panies						
Total oper. exp	616	598	636	669	725	775	772
Taxes	205	215	243	255	286	330	338
Retirement or depr	160	170	180	188	200	215	218
Total rev. deduc	981	983	1,059	1,112	1,211	1,320	1,328
Operating Income (Elec.)	738	681	677	701	730	735	720
Rent (net charge)	10	11	9	10	8	8	8
Balance of income before interest and dividends	728	670	668	691	722	727	712

[a] Incl. uncollectible bills. * Preliminary. † Electrical World estimate.

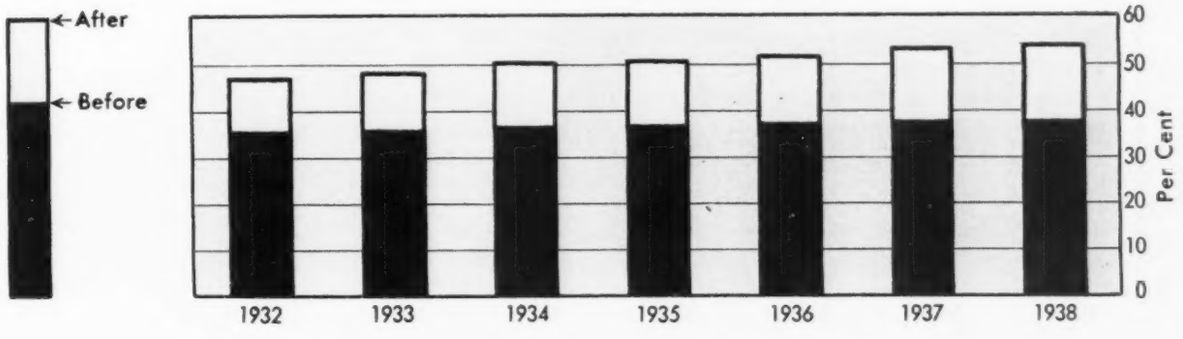
OPERATING RATIO BEFORE AND AFTER TAXES

Private Electric Light and Power Industry

Per Cent	1932	1933	1934	1935	1936	1937	1938
Before Taxes	35.8	35.9	36.7	36.9	37.2	37.7	37.7
After Taxes	47.7	48.8	50.6	50.9	52.0	53.8	54.4

OPERATING RATIO BEFORE AND AFTER TAXES

Private Electric Light and Power Industry



OPERATING EXPENDITURE, OPERATING RATIO, EMPLOYEES

(100 per cent of the industry. Money values in thousands of dollars)	1912	1917	1922	1927	1929	1930	1931
Revenue from ultimate consumers	.....	.....	.....	.....	1,938,520	1,990,955	1,975,945
Other sources	.....	.....	.....	.....	167,380	160,195	149,166
Total electric	287,138	502,060	1,020,329	1,802,655	2,105,900	2,151,150	2,125,111
Operating expenditures†	152,629	289,912	588,068	828,168	934,890	946,180	913,910
Net (before depr., int. and taxes)	134,509	212,148	487,261	974,487	1,171,010	1,204,970	1,211,201
Operating ratio, per cent	53.2	57.5	52.3	46.0	44.4	44.0	43.0
Salaries and wages‡	61,162	95,242	212,434	390,000	405,000	423,000	392,000
Number of employees	79,335	105,541	150,762	251,020	289,000	298,000	282,000

	1932	1933	1934	1935	1936	1937	1938*
Revenue from ultimate consumers	1,813,717	1,754,566	1,831,871	1,911,989	2,044,587	2,180,788	2,172,750
Other sources	147,394	132,694	143,414	152,764	163,500	163,000	160,000
Total electric	1,961,111	1,887,260	1,975,285	2,064,753	2,208,087	2,343,788	2,332,750
Operating expenditures†	817,950	795,811	857,200	867,450	963,087	1,018,288	1,017,750
Net (before depr., int. and taxes)	1,143,161	1,092,449	1,118,085	1,197,303	1,245,000	1,325,500	1,315,000
Operating ratio, per cent	41.7	42.1	43.3	42.0	43.6	43.5	43.7
Salaries and wages‡	323,880	292,000	316,000	330,000	360,000	405,000	402,000
Number of employees	244,573	232,000	247,000	248,000	268,000	282,000	274,000

Sources—Early years Census. Ult. Consumers, '27–'38, E. E. I. Oper. exp. '27–'34, Elec. World surveys; '35–'38 study of oper, ratios, Stand. Statistics, slightly adjusted.

Employees and their pay, from Census, with intervening years from Bureau of Labor index numbers.

* Estimated on ten months' operations.

† Includes maintenance but not taxes or depreciation.

‡ Included in operating expenditures.

FINANCING

Just Short of One Billion Raised — Chicago and New York Systems Account for 41% of Total — Larger Operations Expected in 1939

THE volume of financing to be done by the electric utility industry during 1939 is likely to constitute a major portion of all corporate financing during the year, should the industry progress rapidly with present system integration plans and the government's power policy be modified to encourage the raising of new capital for utility expansion.

An indication of what the utility holding companies are contemplating is seen in the year-end announcement of North American Company to issue approximately $105,000,000 in debentures and preferred stock in a move to eliminate its intermediate holding company—North American Edison Co.—and to refund its own debentures. The fact that $1,000,000 annual savings can be effected in interest, dividends and taxes on this transaction by this system may cause others to follow. The industry is faced, even more than ever before, with taxes taking more of net income. Something must be done to maintain financial health.

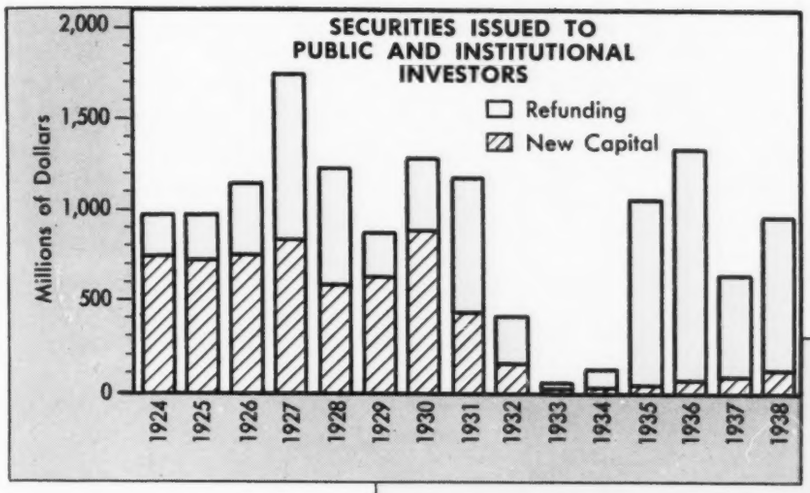
One of the major aids to large-scale utility financing is the continued easy money policy of the government to finance its tremendous needs. The glut of funds in banks and other institutions for investment purposes has become a serious problem. It is likely that these institutions will look to the utility industry for profitable investment media.

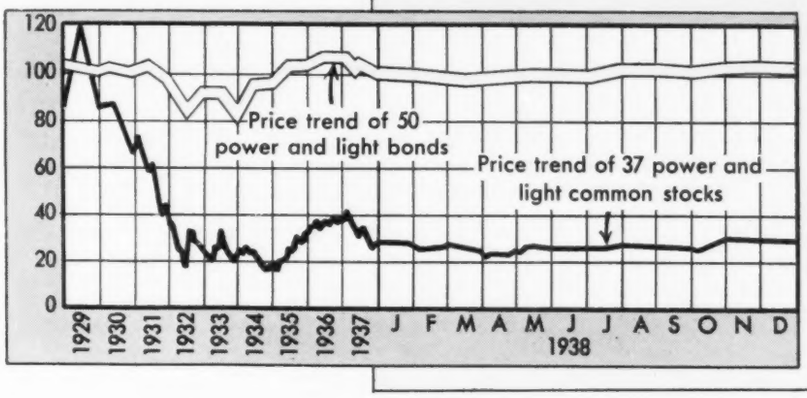
During 1938 the electric utilities raised $962,105,667, of which $840,949,185 was for refunding purposes and $121,156,482 was new capital. While this was in excess of 1937, its significance is overshadowed by the operations of two large systems—Consolidated Edison and Commonwealth Edison systems. The New York utility system raised $43,402,200 in new capital and refunded $71,240,000 of securities, a total of $114,642,200, which was near 12 per cent of the industry total. Commonwealth Edison raised $15,000,000 in new capital and refunded $188,598,800 of securities, a total of $203,598,800, which was about 21 per cent of the industry total. When the total of these two systems is added to the $80,000,000 refunding of Public Service of Northern Illinois, the combined total of $398,241,000 constitutes over 41 per cent of all financing by the electric utility industry. It will also be seen that Consolidated Edison and Public Service of Northern Illinois raised about 48 per cent, or $58,402,200, of the new capital of the industry during the year.

During 1937 the industry sold to private investors five issues aggregating $5,226,000. In 1938 there were twelve issues, aggregating $52,565,000, placed privately. It appears probable that more utilities will in the future utilize that channel for raising funds.

Since 1931 the utility industry has raised comparatively little money from the sale of stocks. Most of the financing has been in bonds and debentures, of which most was refinancing. The industry has now reached the stage in its development where new capital—mostly equity—must be raised if further extensive expansion is to be made. Before this can be done in substantial amount government competition must be curbed—not only competing federal projects, but PWA loans and grants; a more friendly attitude shown the industry by the government, and confidence restored in the safety of utility investments.

With the Administration asking the industry to build generating plants to meet wartime emergency, as well as meet normal requirements, a great volume of new capital will be needed for construction purposes.





NEW UTILITY FINANCING TOTALS

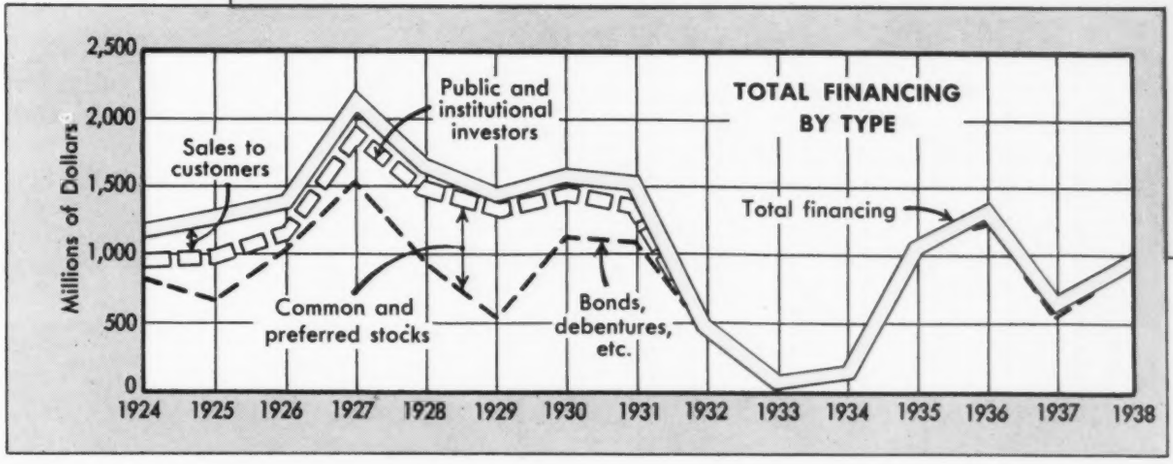
$962,105,667

No. of Issues	Range of Yield	Amount of Issues
MORTGAGE BONDS (Av. yield 3.42%)		
6	2.92–3.00	$72,440,000
5	3.01–3.25	85,668,000
7	3.28–3.34	241,157,000
5	3.38–3.42	73,742,000
8	3.57–3.80	92,050,000
3	4.05–4.87	73,800,000
12	Placed privately	52,565,000
46		$691,422,000
DEBENTURES (Av. yield 3.44%)		
4	2.75–3.37	109,515,000
5	3.50–4.43	120,099,400
9		$229,614,400
NOTES (Average yield 3.58%)		
3	3.50–4.10	13,875,000
2	Placed privately	6,500,000
5		$20,375,000
PREFERRED STOCK (Av. yield 4.85%)		
2	4.71–4.95	18,022,000
3	5.00–5.67	2,672,267
5		$20,694,267
TOTAL FINANCING		$962,105,667
REFUNDING		840,949,185
NEW CAPITAL		121,156,482

SECURITY SALES BY CLASSES (In Dollars)

Year	Bonds, Debentures, etc. (a) (1)	Stocks, Common and Pfd.† (2)	Sales to Customers (3)	Total Financing† (4)	Allocation of Public Sales‡		
					New Capital (5)	Refunding (6)	Total Issues (7)
1924	805,338,600	175,582,200	194,200,000	1,175,120,800	759,399,092	223,021,708	982,420,800
1925	668,524,500	313,698,510	296,000,000	1,278,223,010	726,958,210	255,264,800	982,223,010
1926	1,013,160,000	135,504,982	246,900,000	1,395,564,982	757,870,107	393,094,875	1,150,964,982
1927	1,528,632,500	360,276,764	240,000,000	2,128,909,264	830,439,960	913,194,740	1,743,634,700
1928	922,098,100	549,399,409	170,000,000	1,641,497,509	599,808,500	637,411,952	1,237,220,452
1929	523,407,500	792,051,262	145,000,000	1,460,458,762	624,174,000	257,602,000	881,776,000
1930	1,114,636,200	338,217,641	135,000,000	1,587,853,841	894,473,434	403,061,600	1,297,535,034
1931	1,090,584,000	258,658,193	159,000,000	1,508,242,193	424,163,000	758,741,000	1,182,904,000
1932	404,839,800	47,416,808	18,000,000	470,256,608	165,727,800	239,112,000	404,839,800
1933	53,725,000	2,147,778	375,000	56,247,778	6,812,500	46,912,500	53,725,000
1934	131,175,000	.....	.....	131,175,000	2,430,800	128,744,200	131,175,000
1935	1,067,670,700	.....	.....	1,067,670,700	26,496,111	1,041,174,589	1,067,670,700
1936	1,279,681,200	52,258,963	.....	1,331,940,163	59,727,053	1,272,213,110	1,331,940,163
1937	560,217,000	86,095,334	.....	646,312,334	81,983,646	563,698,748	645,682,394
1938	941,411,400	20,694,267	.....	962,105,667	121,156,482	840,949,185	962,105,667

a To public and institutional investors. † Including rights and warrants. ‡ Not including common stock rights and warrants



BUDGET

For 1939 Down 4½ per Cent to 413 Millions — Reduction Principally in Power Plant — Capital Expenditures 3.9 Billions in Decade Since 1929

CAPITAL expenditures for new utility construction continue to hover between four hundred thousand and half a billion dollars, with preliminary estimates for 1939 at 413 millions, down 4½ per cent from 1938 and but 9 per cent under 1937.

Just as actual expenditures last year were under the first of the year estimates, so can the 1939 expenditures exceed the above figure. In fact, several of the reporting companies mentioned the flexibility of the capital operations to fit expenditures to the immediate requirements. On the assumption that the output curve will continue to follow the pattern of 1935 and 1936, it is not difficult to predict an expenditure in 1939 in excess of half a billion. This would be the largest since 1931.

These capital expenditures are not to be confused with commitments for new construction or with orders to be placed for new capital equipment. These figures represent the amount of money to be paid out, whereas the construction actually started may be some totally different figure. Thus the amount for steam generation, which is substantially lower, in fact, represents such equipment as will be billed in 1939. The amount to be placed can very easily be considerably larger and, because of the time to manufacture, not be reflected in the current year's estimates.

In the first ten years since the depression got under way (1930-1939) the utilities spent for new construction 3.9 billions. In the previous decade, sometimes known as the "boom twenties," the utilities spent 6 billions. In that earlier period of national business expansion the generated output increased 60.5 billion kilowatt-hours. During the present decade the generated output has increased but 20.5 billion. In other words, during the period when the output was growing in the ratio of 1 to 3, the new construction was going ahead at a ratio of 2 to 3. This would seem to refute the criticism that utilities had gone on a buying strike.

Unquestionably, there are vast amounts that could be spent for construction and maintenance that have been deferred. The fact remains, however, that the utilities have left undone nothing that would seriously and adversely affect service.

The 1938 expenditures of 148 millions for 1,465,000 kw. of new generating capacity gave an over-all figure of $101 per kilowatt. On this basis the new capacity for this year will be just in excess of one million kilowatts.

Transmission construction this year will be nearly 25 per cent more than last year and distribution but slightly more than in 1938. Miscellaneous expenses stay about the same, so that the big change is in new generating facilities. As explained before, however, this reflects last year's orders and is not indicative of this year's undertakings. Decisions that might grow out of the present study on power requirements for national defense or a rapid rise in output can easily increase the commitments for new generating capacity substantially in excess of what might be termed normal requirements.

The same situation is true for distribution, particularly if large increases in residential construction arise, as appears probable.

Maintenance expense is expected to be about the same as last year, namely, 117 millions. While this is not a capital expense, it is a guide to future construction expense. A considerable part of this expenditure is made to prolong life of equipment which, under more happy financial conditions, might have been superseded.

CAPITAL EXPENDITURES
Electric Light and Power Industry

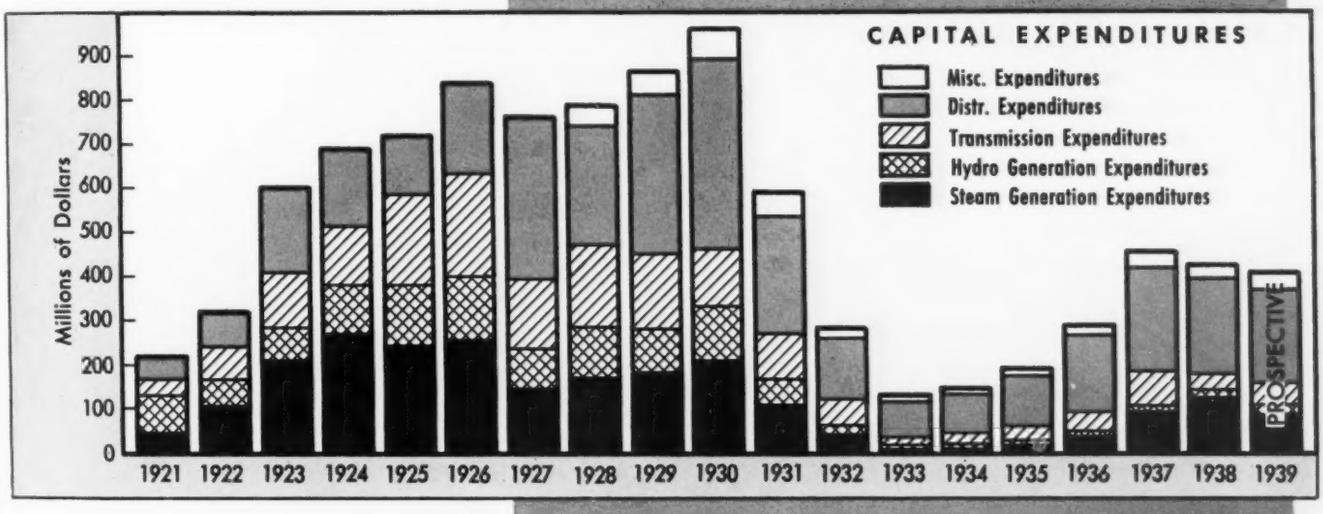
1937 Expenditures	
Generating stations	$107,895,000
Transmission and distribution	313,530,000
Miscellaneous	34,055,000
Total	$455,480,000
1938 Expenditures	
Generating stations	$147,986,000
Transmission and distribution	256,232,000
Miscellaneous	28,817,000
Total	$433,035,000
1939 Expenditures (prospective)	
Generating stations	$107,908,000
Transmission and distribution	269,973,000
Miscellaneous	35,243,000
Total	$413,124,000

CAPITAL EXPENDITURES, 1938, BY REGIONS
(In thousands of dollars)

Region	Steam	Hydro	Transmission	Distribution	Miscellaneous	Total
East	39,841	2,622	6,190	71,140	9,214	129,007
Central	62,088	2,227	10,920	69,332	10,985	155,552
South	22,986	2,498	13,920	44,720	6,648	90,772
West	8,604	7,120	8,040	31,970	1,970	57,704
Total	133,519	14,467	39,070	217,162	28,817	433,035

PROSPECTIVE CAPITAL EXPENDITURES, 1939

East	31,976	2,459	8,305	70,633	12,705	126,078
Central	39,332	1,321	21,849	74,966	13,168	150,636
South	17,030	4,230	9,470	48,540	7,320	86,500
West	5,470	6,090	7,790	28,420	2,140	49,910
Total	93,808	14,100	47,414	222,559	35,243	413,124



ANNUAL CAPITAL EXPENDITURES FOR NEW CONSTRUCTION
Electric Light and Power Industry
(In Thousands of Dollars)

	Steam	Hydro	Transmission	Distribution*	Miscellaneous	Total
1921	49,858	52,816	60,657	59,077	.....	222,408
1922	100,543	63,790	75,588	84,095	.....	324,016
1923	209,417	74,396	125,200	193,130	.....	602,143
1924	269,700	109,540	134,190	179,010	.....	692,440
1925	240,000	140,000	205,700	135,600	.....	721,300
1926	255,107	145,000	231,061	210,176	.....	841,344
1927	146,017	88,866	163,153	362,317	.....	760,353
1928	171,033	113,841	186,190	267,606	48,308	786,978
1929	182,548	98,912	167,565	361,331	55,988	866,344
1930	207,901	117,395	137,085	432,570	65,938	960,889
1931	104,386	60,317	101,031	269,722	61,284	596,740
1932	40,000	20,000	60,000	140,000	25,000	285,000
1933	10,400	4,000	16,100	87,100	11,700	129,300
1934	10,258	5,704	30,180	88,220	13,292	147,654
1935	16,172	6,337	35,349	117,870	17,127	192,855
1936	36,820	9,030	45,220	174,640	24,000	289,710
1937	94,870	13,025	80,030	233,500	34,055	455,480
1938†	133,519	14,467	39,070	217,162	28,817	433,035
1939‡	93,808	14,100	47,414	222,559	35,243	413,124

* Substations generally with distribution. † Preliminary. ‡ Prospective.

ELECTRICAL MANUFACTURING

Production off 33%, but Improvement in Second Half Better Than General Business — Outlook for 1939 Is Better Than 1936 Volume

ON THE basis of the census figures, the electrical manufacturing industry produced in 1938 $1,077,000,000 of electrical products, a decrease from 1937 of 33 per cent. The output lay about midway between the figures for 1935 and 1936.

Add to these figures the production of electrical refrigerators, washing machines, radio, steam turbines, electrical porcelain and glass insulators and the total production for the electrical manufacturing industry in 1938 was approximately $1,600,000,000. This is some $800,000,000 below the 1937 figure.

General business dropped off but 23 per cent, so that electrical manufacturing would appear to have suffered more. On the other hand, using 1925 as 100, we find electrical manufacturing last year at 97, while general business had fallen to 80. In other words, the reason last year's drop seemed so large was because 1937 production had gone so far ahead of other business.

A more illuminating picture of the situation, however, is to be had from a review of the year's progress. The Federal Reserve Board production index, which for the year as a whole was 80 (1925 = 100), progressed from 75 in the first half to 84 in the third quarter and 101 in the final quarter. The NEMA index of electrical manufacturing, which was 97 for the year as a whole, started with 75 in the first half and progressed to 85 in the third and 105 in the fourth quarter. This is an increase of 40 per cent for electrical manufacturing production, compared with 35 per cent for general business.

Outlook for 1939 would place the volume something better than 1936, but still not up to the 1937 level.

The pace, however, is expected to speed up as the year progresses, so that before the year is ended it is possible that the production rate may equal or even exceed the monthly average for 1937.

Sales drop was not evenly distributed over all classifications. Thus, appliances were down 27 per cent, refrigeration 42 per cent, materials 40 per cent, industrial apparatus 37 per cent, generating apparatus no change, transmission and distribution equipment 20 per cent, and insulated wire and cable 28 per cent. Apparently, the products for use by the utility industry fared better than anything else. This is further proved by the comparative figures of utility capital expenditures for construction for 1937 and 1938.

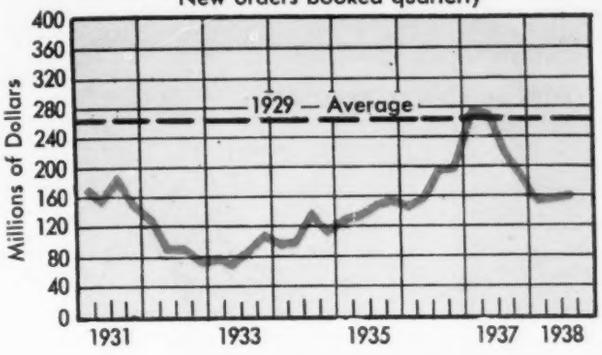
Electric refrigeration production had its most serious setback last year, dropping off from an index level of 1360 to 786, or, as just stated, 42 per cent. Its only other setback of record was in 1933, when production dropped off 26 per cent, over a two-year period, however. While it is doubtful if succeeding years will show a continuation of the meteoric rise of recent years, it is safe to assume that 1939 will show a substantial rise over 1938.

Appliance sales should improve next year if for no other reason than the effect of industry promotional programs.

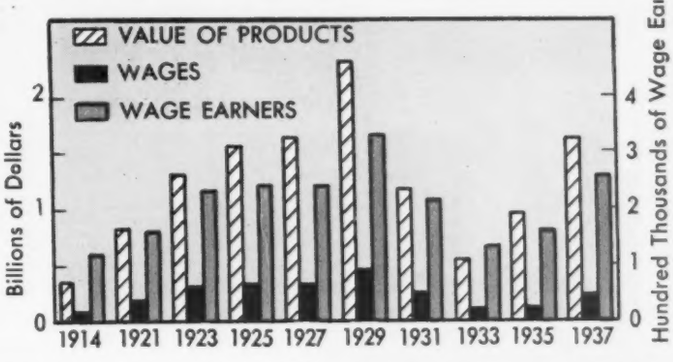
Industrial apparatus reflects more closely the general business condition and should increase. Wire and cable have not yet reflected the improved business conditions, but a healthy rise in new construction, which is predicted for 1939, will stimulate this market no end. Orders for generating, transmission and distribution equipment are budgeted by the utilities at approximately the same as last year, but there are several things that can improve this picture materially before the end of the year.

ELECTRICAL GOODS

New orders booked quarterly



ELECTRICAL MANUFACTURING

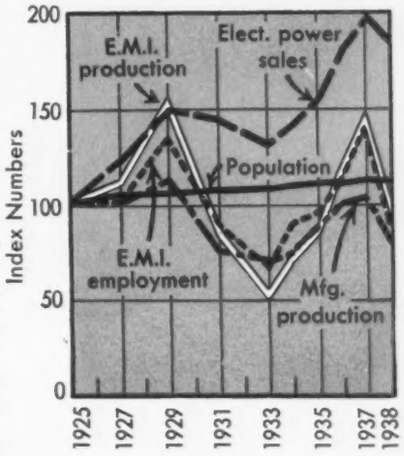


ELECTRICAL MANUFACTURING INDUSTRY AND RELATED FACTORS, 1925-1938

Index Numbers 1925 = 100

	1925	1927	1929	1931	1933	1934	1935	1936	1937	1938†
1. E. M. I. production	100	112	156	85	51	70	85	119	145*	97
2. E. M. I. employment	100	101	137	90	68	88*	94*	110*	142*	90
3. F. R. B. production	100	101	113	76	71	74	86	100	104*	80
4. Sales of electricity	100	122	150	144	131	141	155	180	199	187
5. Population	100	103	106	108	109	110	111	112	113	113

Source, N.E.M.A. * Revised. † 1938 figures estimated by N.E.M.A. statistical department.



NOTES

1. **E.M.I. PRODUCTION** based on U. S. Census of Manufactures and data compiled by N.E.M.A. statistical department. In addition to products shown in electrical machinery apparatus and supplies schedule of the Census are included electric refrigeration, radio apparatus and supplies, steam turbines for electrical drive — other than marine, electrical porcelain, glass insulators and electric washing machines.

2. **E.M.I. EMPLOYMENT** based on labor series of National Industrial Conference Board, but adjusted to 1925 = 100. This series represents the electrical manufacturing industry including radio.

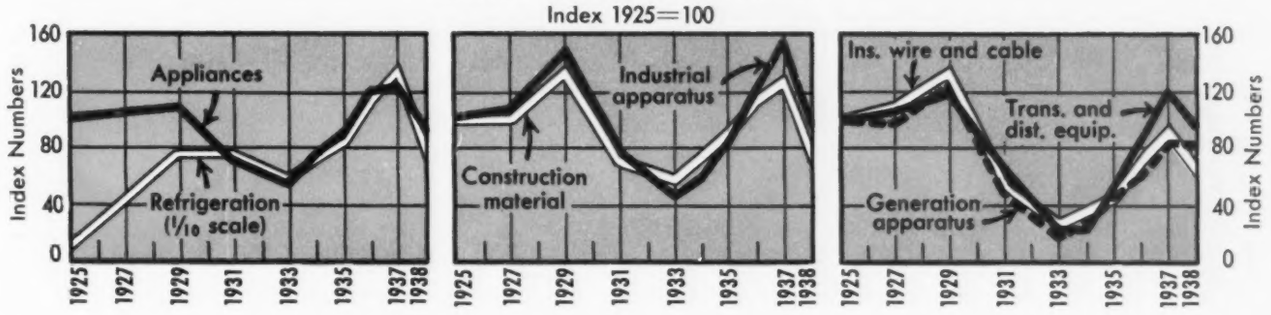
3. **F.R.B. PRODUCTION** based on the Federal Reserve Board's index for the manufacturing industry and adjusted to 1925 = 100.

4. **ELECTRIC POWER SALES** index figures for 1927–1937 based upon Edison Electric Institute data. 1925 and 1937 have been estimated by the N.E.M.A. statistical department.

5. **POPULATION** based upon the annual midyear estimates of the U. S. Bureau of the Census.

MANUFACTURERS' SALES

Index 1925=100



SOME MAJOR BRANCHES OF THE ELECTRICAL MANUFACTURING INDUSTRY, 1925-1938

Index Numbers 1925 = 100

	Manufacturers' Sales	1925	1927	1929	1931	1933	1934	1935	1936	1937	1938†
1. Appliances	100 = $140,000,000	100	106	110	72	57*	73	92	121	125*	91
2. Refrigeration	100 = 16,000,000	100	425	766	778	574	747	844	1,131	1,360*	786
3. Electrical material	100 = 38,000,000	100	100	135	71	59	74	93	116	128*	77
4. Industrial apparatus	100 = 132,000,000	100	105	149	75	47	59	83	118	156*	98
5. Generation apparatus	100 = 37,000,000	100	100	123	50	18*	28	46	59	81*	81
6. Trans. and dist. equip	100 = 180,000,000	100	106	120	64	22	33	50	83	120*	96
7. Ins. wire and cable	100 = 110,000,000	100	106	133	54	27	36	46	69	92*	66

Source, N.E.M.A. * Revised. † 1938 figures estimated by N.E.M.A. statistical department.

NOTES

1. **APPLIANCES** include domestic kitchen and table appliances, electric ranges, electric water heaters, electric vacuum cleaners, electric washing machines, electric fans and food service equipment.

2. **HOUSEHOLD REFRIGERATION** includes complete units, parts and cabinets. Commercial refrigeration equipment and air-conditioning equipment are excluded. These index figures appear unusually large because the household refrigeration industry was just beginning about 1925 and therefore the base figure is small.

3. **ELECTRICAL MATERIAL** includes carbon, electrical porcelain, laminated phenolic products, manufactured electrical mica and vulcanized fiber. Molded insulation is excluded.

4. **INDUSTRIAL APPARATUS** includes electric welding equipment and wire, industrial controls, industrial heating equipment and motors and generators (excluding all generators except motor-generator sets). Electric furnaces and electric tools are excluded.

5. **GENERATOR APPARATUS** includes large generating and converting apparatus and steam turbines for electrical drive. (Also included are small generators which could not be separated from the large generator data). Accurate figures not available.

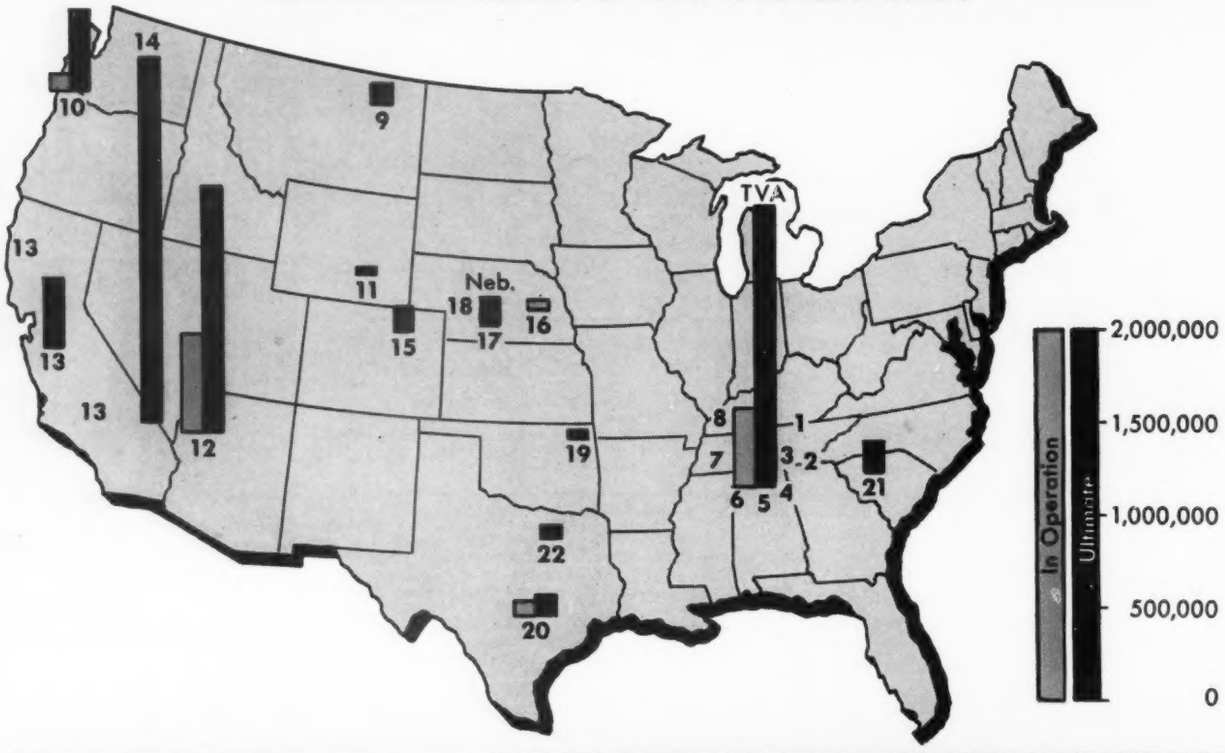
6. **TRANSMISSION AND DISTRIBUTION EQUIPMENT** includes switchgear, capacitors, feeder voltage regulators, high-voltage insulators, power and distribution transformers, lightning arresters, pole line hardware and earth anchors, panelboards and distribution boards, small air circuit breakers and electrical measuring instruments.

7. **INSULATED WIRE AND CABLE** for light and power includes wire and cable of various types of insulation such as paper, rubber, varnished cambric and weatherproof used primarily for lighting and power circuits and lines. Bare wire is excluded.

All indices based upon U. S. Census of Manufactures data and N.E.M.A. statistical department data corrected where possible to represent the entire industry.

FEDERAL POWER PROJECTS

LOCATION AND CAPACITY OF FEDERAL POWER PROJECTS



NOTES

a TVA joint investment, covers navigation, flood control, power.

b Joint allocation for power at Wilson, Norris, Wheeler (the only dams in operation in 1938) amounted to $49,360,179. Guntersville scheduled for operation but no output reported.

c Not including generating unit.

d Bonneville — Navigation $42,600,000, power house and generating facilities $32,400,000. Ft. Peck — Navigation $116,150,000, power $6,750,000.

e Includes all-American Canal.

f For dam and irrigation development.

g Includes Alcova Dam and irrigation district.

h Includes whole project; Shasta Dam alone will have power development.

i In addition $24,660,000 for irrigation.

FEDERAL POWER PROJECTS

	Project	Estimated Cost ($100)	Ultimate Capacity (Kw.)	Added in 1938 (Kw.)	In Operation end 1938 (Kw.)
	Tennessee Valley Authority				
1	Norris Dam	30,993 [b]	100,800	0	100,800
2	Hiwasse Dam	20,000	115,000	0	0
3	Chicamauga Dam	37,000	108,000	0	0
4	Guntersville Dam	33,400	97,200	72,000	72,000
5	Joe Wheeler Dam	32,073 [b]	259,200	0	64,800
6	Wilson Dam	35,024 [b]	444,000	0	184,000
7	Pickwick Dam	31,837	216,000	0	0
8	Gilbertsville Dam	95,000 [c]	160,000	0	0
	Total TVA	315,327 [a]	1,500,200	72,000	421,600
	Corps of Engineers				
9	Fort Peck	122,900 [d]	105,000	0	0
10	Bonneville	75,000 [d]	432,000	86,400	86,400
	Bureau of Reclamation				
11	Kendrick (Casper-Alcova)	20,000 [g]	32,000	0	0
12	Boulder Dam	165,000 [e]	1,320,000	165,000	535,000
13	Central Valley	170,000 [h]	365,000	0	0
14	Grand Coulee	394,500 [f]	1,975,000	0	0
15	Big Tompson	19,083 [i]	145,000	0	0
	Nebraska District				
16	Loup River	8,700	47,000	47,000	47,000
17	Central Nebraska	30,096	66,000	0	0
18	Platte Valley	11,225	37,500	0	0
19	Grand River	20,000	40,000	0	0
20	Lower Colorado R. Auth.	28,730	100,000	85,000	85,000
21	Santee-Cooper	37,500	160,000	0	0
22	Brazos	50,000	75,000	0	0
	Totals	1,468,061	6,399,700	455,400	1,175,000

REA STATUS

AT THE end of 1938 more than 150,000 rural customers were being served with electricity by lines constructed with funds loaned by the Rural Electrification Administration. This is an increase of more than 100,000 above the number receiving service at the end of 1937. Of these rural customers, more than 85 per cent are on farms. It is estimated that there were approximately 70,000 miles of REA-financed rural lines energized at the year's end.

Allotments for loans for rural electrification projects in 45 states made to December 1, 1938, total $160,564,710. Approximately $154,500,000 of this total is for the construction and operation of rural lines. $4,000,000 for generating plants and $2,000,000 for wiring and plumbing. These funds were made available to 483 borrowers, of which 425 were co-operatives. During the first eleven months of the calendar year 1938 allotments totaled $80,099,602, of which about $76,300,000 was for the construction and operation of rural lines.

RURAL ELECTRIFICATION ADMINISTRATION

Total Allotments by Regions, as of November 12, 1938

Region	Allotments Up to 1938–39 Funds Amount	Allotments From 1938–39 Funds Amount	No. of Projects	Grand Total Allotments From All Funds Amount	No. Projects Energised
U. S. Total	$90,146,310	$70,418,400	483	$160,564,710	315
New England	183,000	66,000	3	249,000	0
Middle Atlantic	3,017,000	2,639,500	10	5,656,500	10
East North Central	27,678,650	22,163,500	109	49,842,150	75
West North Central	22,872,387	16,484,000	118	39,356,387	83
South Atlantic	10,682,130	10,334,900	71	21,017,030	48
East South Central	7,650,808	7,486,200	59	15,137,008	34
West South Central	9,828,985	7,971,800	61	17,800,785	36
Mountain	4,749,150	2,566,500	36	7,315,650	20
Pacific	3,484,200	206,000	15	3,690,200	9
Possessions					
Puerto Rico	0	500,000	1	500,000	0

Approximately 87 per cent of REA's borrowers are co-operatives; 8 per cent are power districts, irrigation districts or municipalities, and 5 per cent are private utility companies.

The Seventy-fifth Congress voted $100,000,000 to be made available with the current fiscal year at the discretion of the President for rural electrification projects, in addition to the $40,000,000 provided in the Rural Electrification Act of 1936. In the neighborhood of $70,000,000 was unallotted as of December 1, 1938, but applications under consideration were substantially in excess of this sum.

Allotments have been increasing. During the period from May 11, 1935, to December 31, 1935, they amounted to $6,949,012, or 4.3 per cent of the total thus far. In the year 1936 they rose to $37,356,766, or 23.3 per cent. In 1937 they were nearly as large—$36,159,330, or 22.5 per cent. The remaining half of the entire amount was allotted during the first eleven months of 1938.

Further progress was made during 1938 in lowering the constructions costs of rural lines. The average cost per mile of all lines financed by REA up to the end of 1937 approximated $970. The average per mile cost for lines released for construction during 1938 dropped to below $900 and the per mile cost for some projects was under $700.

There was completed in 1938 twelve small generating plants by a number of projects in widely scattered sections of the United States. Six others are under construction. Of the eighteen plants, fourteen have Diesel engines, one has gas engines, three are hydro-electric with heads ranging from 38 to 230 ft. Ultimate capacities range from 120 to 4,000 kw. Present capacities range up to 2,100 kw.; only five plants have more than 1,000 kw.

FEDERAL power projects now in process of development will have an ultimate capacity of 6,400,000 kw. and will involve an investment, including costs allocated to navigation, flood-control and irrigation, of about $1,500,000,000. The capacity is equivalent to 18 per cent of the present rating of electric light and power plants. The costs given in the table refer in general to the ultimate investment, but those for TVA represent initial capacity only.

Of the 1,175,000 kw. now in operation, amounting to somewhat more than one-sixth of the entire program, 455,400 kw., or nearly 40 per cent, came in during 1938 in various parts of the country—TVA, Bonneville, the Nebraska district, Boulder and the Lower Colorado.

OUTSTANDING FACTS

Statistics Relating to the Electric Light and Power Industry for Year's Operations or Status at the End of the Year

	1930	1932	1933	1934	1935	1936	1937	1938*
CAPITAL invested ($1,000)	11,800,000	12,600,000	12,800,000	12,900,000	13,100,000	13,400,000	13,800,000	14,200,000
Securities issued ($1,000)[3]	1,587,853	470,257	56,248	131,175	1,067,671	1,331,940	646,312	962,106
Securities ex w. & r. ($1,000)[2]	1,297,535	404,840	53,725	131,175	1,067,671	1,331,940	645,682	962,106
New cap. ($1,000)	894,473	165,728	6,813	2,431	26,496	59,727	81,983	121,157
Refunding ($1,000)	403,062	239,112	46,912	128,744	1,041,175	1,272,213	563,698	840,949
REVENUE elec. serv. ($1,000)	2,151,150	1,961,111	1,887,260	1,975,285	2,064,753	2,208,087	2,343,788	2,332,750
From ult. consumers ($1,000)	1,990,955	1,813,717	1,754,566	1,831,871	1,911,989	2,044,587	2,180,788	2,172,750
Farm ($1,000)	46,690	47,128	46,502	49,183	48,405	59,286	67,947	74,500
Residential ($1,000)	642,276	640,385	623,797	648,802	673,526	696,997	740,219	781,200
Small lt. and pwr. ($1,000)	575,598	500,993	471,781	490,420	519,213	562,122	604,848	615,500
Large pwr. and lt. ($1,000)	566,468	474,425	468,390	499,452	531,107	581,149	615,049	542,500
Other consumers ($1,000)	159,922	150,786	144,096	144,013	139,737	145,032	152,724	150,050
Other sources ($1,000)	160,195	147,394	132,694	143,414	152,764	163,500	163,000	160,000
EXPENDITURES								
Additions, extensions ($1,000)	960,890	285,000	129,300	147,654	192,855	289,710	455,480	433,035
Operating, total ($1,000)	946,180	817,950	795,811	857,200	867,450	963,087	1,018,288	1,017,750
Salaries and wages ($1,000)	423,000	323,880	292,000	316,000	330,000	360,000	405,000	402,000
PRIVATE COMPANIES								
Oper. Revenue [1] ($1,000)		1,719,000	1,664,000	1,736,000	1,813,000	1,941,000	2,055,000	2,048,000
Oper. exp.[1] ($1,000)		602,000	579,000	623,000	669,000	725,000	775,000	772,000
Taxes ($1,000)		205,000	215,000	243,000	255,000	286,000	330,000	338,000
ENERGY (1,000,000 kw.hr.)								
Generated	88,592	76,714	78,933	84,986	92,612	106,566	115,166	109,000
From fuel	59,387	45,913	47,576	53,917	56,068	69,336	74,206	67,600
From water power	29,205	30,801	31,357	31,069	36,544	37,230	40,960	41,400
Total, incl. imported and purch.	91,957	79,692	89,411	88,353	95,864	109,685	119,810	113,850
RATINGS								
Generator rating (kw.)	32,049,919	33,864,072	33,733,620	33,524,471	33,888,305	34,260,071	34,960,321	36,000,000
Steam (kw.)	23,427,058	24,358,777	24,165,698	23,780,148	23,989,227	24,106,618	24,637,926	25,600,000
Water power (kw.)	8,046,732	8,922,969	8,974,887	9,140,690	9,288,537	9,538,640	9,634,014	9,700,000
Int. combust. eng. (kw.)	416,129	582,326	593,035	603,633	610,541	614,813	688,381	700,000
FUEL CONSUMPTION								
Coal and coke (1,000 short tons)	39,702	27,589	28,039	30,942	32,243	39,535	42,338	38,274
Oil (1,000 bbl.)	8,950	7,269	9,446	10,076	11,112	13,926	14,104	13,282
Gas (billion cu. ft.)	119	107	101	125	121	150	171	168
ENERGY SALES								
Ult. consumers (mil. kw.-hr.)	74,906	63,711	65,916	71,082	77,596	90,044	99,446	93,400
Farm	1,789	1,579	1,633	1,857	1,692	2,138	2,389	2,520
Residential	10,703	11,494	11,359	12,233	13,496	14,992	16,875	18,580
Small light and power	13,944	12,106	11,589	12,278	13,588	15,612	17,558	18,500
Large power and light	40,148	30,964	33,857	36,944	40,865	48,655	53,546	44,060
Other	8,322	7,568	7,478	7,770	7,955	8,647	9,178	9,740
CUSTOMERS								
Total number (1,000)	24,556	23,878	24,027	24,663	25,313	26,206	27,164	27,765
Farm	650	709	713	744	789	1,043	1,242	1,410
Residential	19,880	19,140	19,301	19,866	20,446	20,988	21,698	22,010
Small light and power	3,626	3,604	3,621	3,670	3,711	3,825	3,892	3,972
Large power and light	347	371	335	324	305	280	260	270
Other	53	54	57	59	62	70	72	103
People in electric lighted homes	83,400,000	82,500,000	82,500,000	84,500,000	87,000,000	90,000,000	94,000,000	96,000,000
Per cent of total population	68.2	67.0	66.7	67.1	68.5	70.3	73.0	73.8
EMPLOYEES, total	298,000	244,573	232,000	247,000	248,000	268,000	282,000	274,000

* Estimated, generally on ten months' operations

[1] Intercompany transactions eliminated.

[2] Does not include warrants and rights.

[3] Includes warrants and rights.

CHRONOLOGY OF 1938

JANUARY

In Alabama Power and Duke Power cases U. S. Supreme Court upholds PWA loans and grants to municipalities.

U. S. Supreme Court agrees to review Electric Bond & Share utility act test case.

Roosevelt holds conferences with utility executives.

Jackson-Willkie debate draws nationwide audience.

Roosevelt assails utilities in Jackson Day speech.

State Supreme Court kills Wisconsin's WDA.

Wide TVA inquiry sought in Congress.

Columbia G. & E. files with SEC.

FPC annual report defends 7-TVAs; urges prudent investment.

Supreme Court ends Buzzards Roost litigation.

Willkie proposes sale of utilities as way out of TVA crisis.

Kellogg challenges President's figures $600,000,000 assets control industry.

Bryan C. Hanks, president of Florida P. & L., charges Miami officials seek $250,000 bribe to end rate case.

Three-judge Federal court upholds validity of TVA power program.

A.I.E.E. meet in New York. Gano Dunn gets Edison medal.

FEBRUARY

Buffalo, Niagara Electric announces plans to spend $5,000,000 to improve distribution facilities and build new Seneca switching station.

Electric Bond & Share files brief attacking utility act.

Detroit Edison announces $18,000,000 building program.

Birmingham Electric files suit to bar Bessemer and Tarrant from building competing plants.

Manufacturers, through Modern Kitchen Bureau, to carry out 6-point program on electric range sales.

Record ice jam at Niagara Falls damages Ontario hydro plant of Hydro-Electric Power Commission.

John C. Parker nominated as president of A.I.E.E.

CIO launches drive to organize utility workers.

NEMA to study reciprocal trade pacts; honors at winter convention in N. Y. six veterans of 50 years of continuous service.

SEC Chairman Douglas tells utilities they have lost opportunities for constructive work by fighting utility act.

Secretary Ickes starts flow of $99,637,952 of PWA money for 61 public power projects. First voucher goes to Memphis for $1,000,000.

Gov. Graves asks Alabama Power to cut rates to TVA level plus taxes.

Supreme Court hears arguments of utility act test case.

Bonneville Dam power base set at 57 per cent of cost by FPC.

Chairman Maltbie of N. Y. commission warns rising taxes bar further electric rate cuts.

Lynn (Mass.) Gas & Electric maintains service during $700,000 fire which destroys coal handling facilities.

Lilienthal tells meeting in Milwaukee he favors cities owning utilities.

Thomas A. Edison Memorial Tower at Menlo Park, N. J., dedicated.

Engineers Public Service and United L. & P. register with SEC.

General Electric signs with CIO.

George H. Bucher elected Westinghouse president.

Dr. Arthur E. Morgan supports Bonneville Administrator Ross on proposal to purchase private utilities.

MARCH

Engineers Public Service merges three Gulf Coast units.

Knoxville reopens negotiations to purchase utility property.

Congress allots $40,000,000 to REA.

Storm on Pacific Coast wrecks utility systems.

Chairman Morgan asks Congress to investigate TVA after a series of charges, and counter-charges by his associates.

Willkie proposes TVA buy utilities in area. Lilienthal offers 5-point plan of study.

President calls TVA directors to White House. Chairman Morgan refuses to recognize President's "on carpet" inquiry.

President consents to TVA Congressional inquiry.

California utilities rehabilitate flood-wrecked lines and systems.

President removes Arthur E. Morgan as TVA head; names Harcourt A. Morgan new chairman.

Carlisle visions prosperity era when government restores faith. Asks settlement of controversies. Breaks ground for Consoli-

dated Edison building at New York World's Fair.

U. S. Supreme Court refuses to review Kansas State Supreme Court decision upholding state utility act which allows cities to invade territory of private utilities.

Supreme Court upholds registration provisions of utility act in Electric Bond & Share litigation.

President Pack of Northern States Power announces $7,917,000 building program. Largest in three years.

APRIL

E.E.I. holds sales meeting in Chicago.

Supreme Court upholds New York 3 per cent utility tax for unemployment relief.

Oregon defeats public ownership; seen as blow to Bonneville.

Middle West hard hit by sleet and snow storm.

PFC approves sale of Southern Nebraska Power to public district for $898,000 cash.

New Hyde Park, N. Y., abandons plans to build own plant with PWA funds.

Public Service of New Jersey to raise $10,000,000 for capital expenditures.

Fluorescence, new form of lighting, introduced.

Eighteen utilities, in appeal from three-judge lower court decision, ask Supreme Court to rule on TVA constitutionality.

MAY

Engineers at E.E.I. meeting seek to define rating of all power system equipment.

House passes bill to install power units at Fort Peck Dam.

Chairman Douglas gives exclusive story to ELECTRICAL WORLD, "Step by Step," outlining way to proceed under utility act to integrate properties.

Heads of 14 utilities form committee to co-operate with SEC; Roosevelt hails peace move.

U. S. Chamber of Commerce asks government to withdraw from competition with utilities.

Standard Gas to spend $33,979,000 on new construction.

Independent auditors start audit of Commonwealth & Southern properties in TVA area for basis of sale to TVA.

Congress gives REA right to borrow $60,000,000 from RFC.

Congressional group sifts TVA charges as inquiry opens in Washington.

Virginia Public Service elects O'Connell president after ousting of Alex Speer.

JUNE

Associated Gas officials vacate posts, blocking move by FPC to delve into company interlocking positions.

Puerto Rico Legislature fails to vote on "little TVA" bill.

Kellogg re-elected president of E.E.I. at Atlantic City convention.

James H. McGraw tendered testimonial by McGraw award prize winners.

Senate kills move to curb PWA funds for city competing plants.

Secretary Hull sends new St. Lawrence proposal to Canada.

TVA allocates 52% of cost to power facilities.

Iowa cities abandon plans to build own plants.

Long Island Lighting signs labor contract; averts strike.

Wisconsin Supreme Court upholds state's "little TVA," but curbs powers.

JULY

Electrical manufacturers to get $23,000,000 of business from PWA projects.

Basil Manly reappointed to FPC for five-year term.

Knoxville, Tenn., gets $5,800,000 from RFC to buy Tennessee Public Service properties.

Canadian Electric Association urges greater attention to public relations.

United Corp. to write off $434,130,478 of stock losses.

New York Consolidated Edison orders 500,000 appliances in "bargain package" sale.

PWA withholds $100,000,000 funds from San Francisco to force decision on Hetch Hetchy.

Chattanooga moves to take over local utility.

Secretary Ickes says PWA power policy is not to duplicate existing facilities if "reasonable and fair" offer is accepted.

Samual Insull, dominant figure in utility industry, dies July 16.

SEC picks Utilities P. & L. as first "death sentence" test.

AUGUST

Philip Torchio retires from New York Consolidated Edison.

Storm of criticism hits Lower Colorado River Authority power project as Buchanan, Inks and Marshall Ford dams fail to prevent devastating flood above Austin.

Northwestern Electric contracts to take 5,000 kw. from Bonneville; first sizable block sold.

Chairman Douglas asks utilities to submit by Dec. 1 tentative plans of integration.

John Newton Shannahan, head of Midland United, dies.

Potomac Edison completes in thirteen months new Cumberland 30,000-kw. steam plant.

Government officials join Montana Power in dedicating 154,000-hp. Flathead hydro project.

SEPTEMBER

Duke Power installs 55,000-kw. unit in Riverbend steam plant.

Public Service Electric & Gas of New Jersey adds 50,000 kw. to Essex station.

I.E.S. meets at Minneapolis; elects D. W. Atwater president.

Award contracts for three Grand Coulee generators; largest in world.

Knoxville pays $5,319,041 and TVA $2,512,858 for local utility.

Texas P. & L. offers to sell properties to LCRA.

Roosevelt appoints Asst. Secy. of War Louis J. Johnson to head committee to study war emergency power needs.

Kentucky-Tennessee L. & P. sells properties to city.

Work started on Shasta Dam power project.

Pennsylvania Electric Association elects W. H. Swinney president.

Empire State Gas and Electric Association elects Edward P. Prezzano president.

Utilities do heroic job in restoring service to communities stricken by hurricane which swept northeastern seaboard September 21.

OCTOBER

Chairman Robertson of Westinghouse "plants" "Time Capsule" at World's Fair.

Charles E. Hoffman, assistant secretary of TVA dismissed.

Memphis rejects offer of Memphis P. & L. to sell properties for $16,401,419; city counters with $13,500,000 offer.

John P. Pulliam, president of Wisconsin Public Service honored by associates for 50-year record of public service.

Standard G. & E. makes changes to conform to utility act. Victor Emanuel becomes chairman. Hagenah named president of system's service unit.

SEC approves plan to simplify Republic Electric Power.

LCRA furnishes Austin with power as first city customer.

Columbia G. & E. to cut capital value of common stock from $15.75 to $1 a share.

Secretary Ickes dedicates All-American Canal and power project.

Consumers Power buys Adrian, Mich., properties from Cities Service for $3,200,000.

Alabama Power posts bonds for REA loan of $1,500,000.

New York State E. & G. dedicates $2,000,000 Dresden steam plant.

N.E.M.A. sees expanding business; elects Carl L. Peirce, Jr. president.

NOVEMBER

To escape utility act, Electric Power Associates distributes to its stockholders its holdings of American Water Works & Electric.

Ross sets new low retail rates for resale of Bonneville power—2½ cents to ½ cent.

Utilities announce definite commitments for 1,000,000 kw. of new generating capacity as part of President's national defense power committee plan.

TVA and Tennessee communities pay $1,600,000 for West Tennessee P. & L.

United L. & P. and North American file integration plans with SEC.

Voters in Northwest split on public power districts.

National Defense Power Committee adopts preferred standards for steam turbine generators.

Congressional committee hears TVA will have $10,352,000 yearly deficit at "yardstick" rates.

Miami City officials cleared of $250,000 bribe charge.

DECEMBER

N. Y. State Chamber of Commerce opposes St. Lawrence seaway and power project.

Commonwealth Edison to spend $75,000,000 over next two years.

SEC swamped as holding companies file integration plans. Douglass pleased with "100%" response.

Nelson L. Smith, N. H. Public Service Commission chairman, elected president of National Association of Railroad and Utilities Commission.

National Power Show in New York draws 275 exhibitors.

Supreme Court upholds Consolidated Edison labor pact. Holds NLRB has jurisdiction because utility sells power to customers who do interstate business.

Nebraska projects buy Iowa-Nebraska L. & P. properties.

Edward C. Eicher named SEC commissioner.

Kellogg reports utilities installed a net 1,000,000 kw. during 1938.

Year Shows Utility Stability

By C. W. KELLOGG
President Edison Electric Institute

C. W. Kellogg

THE year 1938, so far as general industrial production was concerned, showed in its closing months a substantial recovery from the low point of the secondary depression which began in the latter half of 1937, so that while production was going off sharply in the last part of 1937, it was recovering substantially in the last part of 1938. Comparing the two years as a whole, however, the general index of production for the year just closed was nearly 25 per cent less than for the year before.

This had a decided effect upon the output of electricity, which showed a decrease from the 120,000,000,000 kw.-hr. in 1937 to about 114,000,000,000 kw.-hr. in 1938. This was the first break in the series of inincreases in energy output year by year from the bottom year of the depression in 1932. It emphasizes what many have realized for some time, namely, the extent to which industry is electrified in our country. This has the inevitable effect of causing the output and earnings of the electric utilities to vary more with industrial conditions than they did in the early years, when electric service was confined more largely to home and commercial business.

New construction

In spite of the much less favorable business conditions in 1938 than in 1937, it should be stated to the credit of the electric industry that its expenditures for new construction in 1938, totaling approximately $470,000,000, were practically as high as the $480,000,000 so expended in 1937. Also, in the face of a decrease in energy output compared to the previous year for the first time since 1932, the industry still made a net increase of 1,000,000 kw. in its generating capacity, the gross increase in new equipment of latest design having been 1,250,000 kw., while approximately 250,000 kw. of less efficient machinery was withdrawn from service.

Against the background of relatively adverse business conditions, it is encouraging to be able to record an increase of about 600,000 in the number of new electric customers obtained during the year. This brings the total electric customers now to about 27,765,000.

The year just closed has shown excellent results with respect to farm electrification. Of all the new customers connected during the year, 168,000 were on farms, bringing the total of farms supplied with electricity at the end of the year up to 1,410,000. This represents about 22 per cent of all farms having occupied dwellings and some 32 per cent of all farms having dwellings valued at $500 or more. The corresponding figures only four years ago were 11.6 per cent and 17.2 per cent respectively, so that the relative intensity of farm electrification has been about doubled in the last four years. The basic problem of farm electrification continues to be the devising of ways and means whereby farmers can utilize electricity economically in their farm operations. About a quarter of a million farms located adjacent to rural electric lines are today still unable to use the service for economic reasons.

The use of electricity in the home has continued to grow during 1938 more or less along the same line that has been maintained for the last decade. The percentage growth was somewhat less than the preceding

year, but this was due partly to a falling off in the volume of sales of electrical appliances, that being something directly affected by the general business recession. The effect on electric earnings was therefore to be expected, since increased consumption in the home depends largely upon increased use of electrical appliances. The average use per residential customer in 1938 rose to 850 kw.-hr., which compares with 463 kw.-hr. in 1928, and the average revenue per kilowatt-hour for residential consumption declined to 4.20 cents, compared to 6.6 cents in 1928.

So far as revenues were concerned, the electric industry in 1938 again confirmed its reputation for stability of earnings in the face of declining business conditions, the total revenues for the past year aggregating approximately $2,173,000,000, compared with $2,181,000,000 in 1937. The record with regard to net earnings is not nearly so satisfactory. Due to increased operating expenses, the net income, as measured by utility companies that report to Moody's Manual, showed a decline of about 7 per cent in 1938 as compared with 1937. There was, however, a decided improvement in the last half of the year, since the first half year showed a decline of nearly 12 per cent in net earnings below the first half of the previous year.

Obstacles to residential load building

From the public viewpoint there are enough hurdles in the path of the progress of the electric business in the home to require of the utilities the most strenuous sales effort to keep up with progress. The build-up in the average use of electric energy per customer is constantly being discounted earnings-wise by the greater efficiency of the electrical apparatus in the home. For instance, the latest type of electric refrigerator consumes only about 40 per cent as much electricity as those manufactured ten years ago. Electricity also has to meet the competition of improved gas ranges and other heating devices and the use of other fuels in the struggle for the electric cooking and water-heating load.

In spite of the conditions above mentioned, it is believed that the domestic use of electricity should continue to grow during the coming year. The use of electric refrigerators has reached the point where 52 per cent of home customers use them, while in the case of electric ranges, although the number in service has increased 30 per cent during the past two years, the average customer saturation is only 9 per cent. Both the New York World's Fair and the Golden Gate International Exposition in 1939 will have exhibits of a group of model homes which will acquaint millions of visitors with the latest development in electric appliances in the home, and this interest should be further stimulated by the present activity in residence building throughout the country.

Prospects for the coming year depend upon various factors not now capable of exact determination. The present very tentative estimates for new construction in 1937 show about $500,000,000. During the coming year the degree of construction activity will be affected by the National Defense Program of the federal government and by the extent to which the present trend of improvement in business continues or persists through the year. It will depend also upon the market for utility securities, which, in turn, is affected by the policies and attitude of the federal government with respect to the utilities.

Public prefers private operation

As to the attitude of the general public, although in the cities within the orbit of the Colorado River Authority in Texas and of the T.V.A. in states adjoining that project there have been cases where the lure of government largesse proved too tempting to pass up, in the country as a whole the trend of the votes in municipal elections, on the subject of accepting from the government the subsidy of 45 per cent of the construction cost of a municipal plant, has been away from such acceptance. Also, the testimony before the Congressional committee on the T.V.A. has confirmed the repeated claims of the utilities as to the subsidies involved in that organization's rates and accounting. If, therefore, the rising national debt should produce a general public sentiment for economy in national expenditures, it should tend to reduce federal appropriations aimed to compete with the capital of private investors in the utility business.

The Holding Company Act of 1935 appears to be settling down into a fixed part of the utility regulatory system of the country. The decision of the Supreme Court in the Electric Bond & Share case in the spring did not pass on the constitutionality of the act, so that this question still remains for the future. Upon the subsequent request of Chairman Douglas of the S.E.C., practically all public utility holding companies, regardless of their beliefs as to the constitutionality of Section 11, filed plans for the compliance with that section. It is very much to be hoped that these may lead to a solution which will be satisfactory to the commission and fair to the investors in these companies. As the sole purveyors of equity money for the majority of the nation's electric business, nothing is more needful than to have the status of the holding companies settled so that they can continue their useful services to the people.

Fair regulation

The utilities recognize that their function in the body politic is to use the capital of millions of investors to construct, and their own ingenuity and devotion to design and operate, facilities whereby millions of consumers of electricity may obtain that service in the highest quality and at the lowest cost practically obtainable. The utilities have learned from an experience of three decades that the interests of both of these great groups are furthered by adequate governmental regulation; all they ask, in the interest of these same groups, is that such regulation be fair, reasonable and constructive, not merely punitive.

Manufacturers Expect 10 to 30% Increase in Business

By CARL L. PEIRCE
President National Electrical Manufacturers Association

THE ELECTRICAL WORLD has asked me for a brief analysis of conditions as they have affected business during the past year and as they can affect business in the new year. Once again the individual members of the board of governors of Nema have constructively responded to our letter asking their opinions on several phases of the business picture for the coming year. There is a note of optimism, mild to be sure, but nevertheless clear, running through practically all of the replies. Possible dangers are neither disregarded nor overemphasized.

Because these replies are from executives of electrical manufacturing companies, small, medium and large, located in every manufacturing state, because these companies manufacture electrical supplies, devices, appliances and equipment running the whole range of both durable capital and durable consumers goods, the unanimity of their optimistic notes is both noteworthy and heartening.

Carl L. Peirce

Difficult readjustment

The year just closed has been one of difficult readjustment. We entered it with sales volume generally down to or near the 1934 level and with generally excessive inventories of both raw materials and finished goods produced at the highest wage levels in our history. The building up of these excessive inventories was caused in great measure by the imposition of artificial conditions almost completely unrelated or working at cross-purposes to the ordinary functioning of the law of supply and demand.

The year began with public confidence at the lowest ebb since the spring of 1933. People who had money to spend had decided to await a change of trend before exchanging their cash for new cars, refrigerators, ranges or radios or for furniture, carpets or homes. Sales began to decline in April 1937 and were still declining at that year's end.

The results of all these individual curtailments were cumulative. Factories reduced production schedules and as a result workers were laid off or their working time reduced, with consequent still further restriction of purchases. The lowering of factory production schedules reduced freight shipments and passenger traffic. Railroad incomes dropped sharply and railroad purchases of supplies and equipment were greatly reduced.

The vexing matter of subsidized government competition with the private utilities remained unsettled, investor confidence remained shaken, and, although the banks were fairly bursting with idle deposits, utility equity financing could not be undertaken and utility construction budgets which in 1930 totaled over 900 million dollars and then dropped to a depression low in 1933 to 129 million, rose in 1937 to 455 million, had dropped to 433 million for 1938.

Such is a brief outline of some of the conditions at the beginning of 1938. As the year progressed the downward curve of the business index flattened out and in June turned definitely upward. It has climbed upward slowly but steadily since and the excessive inventories of January 1 have been largely liquidated.

Merely to record the drop and subsequent rise is idle unless we can determine the reasons back of them.

Let us go back to 1937 for a moment. One of the common fallacies in reviewing 1937 is to date the beginning of the so-called recession in September. True, September registered the decline in the curves of indus-

trial production and general business activity, but incoming orders dropped long before production. New orders for machine tools, contrary to usual seasonal tendency, started a precipitate decline in March, residential building contracts in April and orders for automobiles and many of the major electrical appliances in May and June.

What was back of that rapid drop in orders? That period of March, April, May and June marks the rise of the curve of industrial disputes to the highest point in American history. It is the period of the sitdown strike, the seizure of private property and of the unrestrained voicing of theories on these matters by individuals high in government circles, both state and national, which were entirely at variance with previous American concepts. It seems a reasonable assumption, bearing in mind the coincidence of the two, that this governmental attitude was one of the direct and principal causes of the breakdown of public confidence, which in turn caused the public to stop buying. This assumption is strengthened by results in ensuing primary and general elections, wherever the voters had an opportunity to register their disapproval of the government's labor policy. Because of those very definite election results we can look forward with some confidence to constructive changes in that policy.

Utility market

The electric utilities have recently made new energy production peaks. Ordinary peace-time demands will soon necessitate large additions to the generating transmission and distribution facilities. Added to this are the many accumulated reconstruction and maintenance programs deferred during the depression years. Without including possible additions for defence preparedness, expenditures of many hundreds of millions would be made by the utilities if investor confidence was restored and equity financing could be undertaken. Most utilities have followed a wise course in steering away from unbalanced financial set-ups in which funded debt represented a major part of their capital structures and a resumption of equity financing is a necessity before increased construction can be safely projected. This, however, seems remote so long as the government continues to compete both directly through government projects and indirectly through grants and loans to municipalities and power districts. It is hoped the year 1939 will see an equitable solution, for until such a solution is reached thousands of men will be kept from gainful employment.

As we enter 1939, excessive inventories have to a great extent been worked off. This means that employment and payrolls will increase at a somewhat more rapid pace than the rise in the general business curve. Public confidence in the continuance of our American system of individual initiative and private enterprise has been in a measure restored. There are other hopeful signs.

Co-operation between all of the branches of the electrical industry, to educate the public to the benefits of electricity in the home, the office, the shop and the factory, is being planned and carried on more effectively and on a higher plane than ever before. The work of the National Adequate Wiring Bureau, sponsored by the whole electrical industry, is an outstanding illustration of the value of teamwork. It is carrying the message of the benefits of adequate wiring, including proper convenience outlets, into almost every city and hamlet. Not only is it reaching the present and prospective home owners but its messages are going into the offices of the architect, the builder and building contractor. The local electrical leagues throughout the country have enthusiastically taken it up. Inadequate wiring with insufficient outlets has long been a deterring factor in the wider use of electricity in the home, yet until the Adequate Wiring Bureau with its slogan—"Whether your Build, Buy or Rent—Insist on Adequate Wiring"—the problem had not been constructively attacked. The success which has already been achieved by the bureau has led to plans for further industry-wide co-operative promotional work.

The previously mentioned letter to the members of the board of governors of Nema asked them to state their opinions on many phases of business for 1939, including the following:

1. Basic trend for business in general.

The replies almost unanimously predicted an upturn with an increase of 10 to 15 per cent in 1939 over 1938.

2. The outlook for the durable goods industry.

It was felt the outlook for durable goods was somewhat better than for business as a whole.

3. The outlook for the electrical manufacturing industry.

The consensus was that the electrical manufacturing industry would probably see a greater upturn than either general business or the durable goods industry. A typical comment was—"Industry sales plans, in which Nema is taking such an active part, are aiding materially in expanding markets for products of electrical manufacturers."

Individual estimates of the probable increase of electrical manufacturing business in 1939 over 1938 ran all the way from 10 to 30 per cent, with a number of comments suggesting the possibility of increases up to 80 per cent if some of the controversial issues now preventing investor confidence could be constructively settled early in the new year. Unless they are settled, the most we can apparently hope for is a return to a level of activity and employment somewhere between 1937 and 1938.

However, let us not forget that gains beget gains, that they are cumulative. Some early indication on the part of Congress that where experience has clearly demonstrated mistakes in recent legislation such mistakes will be corrected might easily bring about such a restoration of confidence as to start real economic recovery spreading to all parts of our national life.

Economic Absurdity

By CARTER FIELD

This noted journalist gives his personal comments and interpretations on current happenings affecting the electrical industry. His background and his location at Washington make his thoughts informative and interesting even though all may not agree with him

REMEMBER the dog in the fable, that, crossing a bridge with a bone in his mouth, saw what he thought was another dog with a bone in his mouth in the water below? Remember how he tried to get that other bone and lost the one he had?

History sometimes repeats itself. Let's consider a few excerpts from President Roosevelt's first address to the present Congress. Also the definition of "yardstick" belatedly given to the Congressional committee investigating TVA by A. J. Krug, speaking for David E. Lilienthal.

From President Roosevelt's speech: "The first duty of our statesmanship today is to bring capital and manpower together. . . ." "The object is to put capital—private as well as public—to work." "It is my conviction that down in their hearts the American public—industry, agriculture, finance—wants this Congress to do whatever needs to be done to raise our national income to eighty billion dollars a year."

"The factors in attaining and maintaining that amount of national income are many and complicated."

"They include the working out of new techniques—private, state and federal—to protect the public interest in and to develop wider markets for electric power."

TVA rate elements

In the hearings of the TVA investigating committee Representative Wolverton asked Lilienthal what were the elements which enabled public production and distribution of power to make lower rates than private companies were able to do. Lilienthal replied that the government could borrow money for 2 per cent, or less, whereas private utilities had to pay a considerably higher rate of interest. He added that the government was able to charge off much of the cost to navigation and flood control, whereas a private company had no way of reimbursing itself for any such advantages, even if it created them. He admitted also that the element of taxes enormously favored public ownership.

"Then what becomes of the yardstick?" inquired Senator Schwartz of Wyoming.

Lilienthal said he would prefer to wait before giving this answer. He wanted time to draft it carefully, so that it could not be knocked down. But he promised to prepare a definition of the yardstick and submit it to the committee.

Double yardstick

That was last summer. Just before Christmas J. A. Krug, chief power planning engineer of the TVA, submitted the long-awaited yardstick definition, which presumably Lilienthal's illness had prevented his delivering in person.

"For five years," said Mr. Krug, "there has been continuous controversy over the 'yardstick' rates of TVA. The question so violently argued is whether the wholesale and resale rates of the TVA constitute a fair standard of electric rates to be charged the public. The answer to the question is 'They do.'

"The term must be defined. There is a power company yardstick and a consumer's yardstick."

"The 'power company' yardstick is simply a measure of the costs of the private utility and the profits which it may exact in its rates as determined by the 'fair return on fair value' rule. I shall not attempt to consider what any power company may legally charge in an area where monopoly makes the power company yardstick the only one to use. No matter what they are, those rates do not necessarily fix the sum that the consumer ought to pay. A consumer of electricity is entitled to take service from the lowest cost source just as certainly as a traveler has a right to patronize the least costly and most satisfactory transportation service.

"What the consumer should pay is the lowest price at which electricity can be supplied by the most efficient available producer with all costs considered. That is the consumer yardstick."

Just weigh these statements in the light of existing knowledge as to the absurdity of the costs allocated to flood control and navigation of the Tennessee River; the absurd writing down of the cost of Muscle Shoals before charging it into the TVA system; the WPA loans and grants; the net loss shown on TVA books for operation; the obvious comparatively insignificant charge for taxes; add to this the fact that the investors who buy government securities for this subsidy to public operation pay no local personal taxes on these securities, and no normal income taxes on the return, both of which they would pay on public utility securities.

The President wants the TVA rates to be nation-wide, sure that such rate reductions would speedily bring about a huge increase in consumption.

Where will money come from?

Assuming that the federal treasury can stand the strain of providing such electric rates for the country, one wonders how much such a development would work toward that eighty-billion-dollar-a-year income.

What of expansion by the privately owned utilities, or sharply reduced incomes on the part of all investors in utilities and consequently lower income taxes? Their purchasing would also sag, which would work in the well-known vicious circle to hurt all business.

The real question, of course, is how long it is going to take a sufficient number of voters to realize the economic absurdity of the thing to force a little common sense on the government.

Editorials

S. B. WILLIAMS, Editor

Thirty-five Years of Statistics

THIRTY-FIVE years ago ELECTRICAL WORLD in its first issue in January presented its first annual electrical industry statistics, a custom which has been maintained ever since.

The first national figures on the electrical industry appeared in the Census for 1902, published some time later. Its editor was T. C. Martin, then editor of ELECTRICAL WORLD. Thus ELECTRICAL WORLD began its statistical compilations almost as soon as any figures were available, and was instrumental in helping the industry secure a knowledge of its national operations.

Thirty-five years ago there was not the report-making organization of today, so that much of the statistical data for the years between the census was necessarily fragmentary, requiring therefore some rather wide estimating to reach totals. Nevertheless, the figures were surprisingly near the actual figures determined later by the census.

In those early years the entire annual statistical report was encompassed in a column or so of type with one small table. Compare that with the present issue of ELECTRICAL WORLD and one gets an idea of how far this industry has progressed in its intricacy.

Thirty-five years ago the central stations grossed a little over 100 million dollars. Last year they grossed 2,173 millions, or more than twenty times as much. Electrical manufacturing (then including telephone and telegraph) billed 159 millions. Last year the billing was 1,600 millions, or ten times as much.

In those early years annual data were not available on capacity, output, expenses, etc. Estimating from census data for 1902, however, the output was approximately 2¾ billion kilowatt-hours. Last year it was 109 billion, or nearly forty times as great. It will be noticed that the revenue increased only half as fast. Capacity of generating plant was 1,240,000 kw., against 36,000,000 kw. today, an increase of twenty-nine times.

The electrical industry was a big industry back thirty-five years ago. It is a much bigger industry today, but even the figures presented in this issue will be dwarfed ten years from now as the initial data are dwarfed by today's operations.

To present these yearly summaries has meant a lot of hard work and painstaking effort. But it has also required considerable patience and co-operation from Edison Electric Institute, National Electrical Manufacturers Association, Federal Power Commission, REA and other government bureaus and state commissions, as well as the co-operation of hundreds of private companies at what is probably the busiest time of the year —report and budget closing. To all of them ELECTRICAL WORLD expresses its appreciation for their help.

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The New TVA Director

EX-SENATOR J. P. POPE of Idaho has been named by the President to the place on the TVA directorate left vacant by the removal of A. E. Morgan. There will be many in the industry who will want to know what kind of a fellow he is. What are his views?

In ELECTRICAL WORLD for April 25, 1936, Senator Pope gave his views on government ownership, on competition, on regulation and on TVA. At the time there probably were many who considered his statement as somewhat radical, but in the last three years so many ideas of much more radical import have been propounded by people close to the Administration that the new TVA director's remarks sound more like a middle-of-the-road attitude.

"Utility rates," he said in 1936, "have been too high for the good of the utilities and consumers alike. Our system of utility regulation is not capable of effectively meeting modern needs. The utilities themselves without direction and regulation have been incapable or unwilling, or both, to meet modern needs."

It was his opinion then that regulation as regards rates could better be effected by means of yardstick competition, but he left the impression that it would be a yardstick that could be met without disaster. In fact, he laid great stress upon the larger volume of business that would accompany lower rates. He looked upon government adventures into the power field as "demonstration utilities," which would "assist in placing utilities on such a basis as to render successful, satisfactory and admirable service from every viewpoint."

While he saw a tendency toward government taking over private utilities, he said: "I believe, however, there is another way out along a pathway quite well defined. . . . I do not favor extensive government ownership and I am sure the great majority of the American people will not favor or demand it, unless they are forced to do so as the last resort. . . . Fulfilling the public need in the course charted by the TVA is the place for the private utility. If it will take advantage of that place, government ownership will not become generally necessary."

While the words are different, the opinions are pretty much the same as those expressed on several occasions by the deposed TVA chairman, A. E. Morgan. If TVA had been a "demonstration" not as to how low

rates could be made with aid of subsidy, arbitrary accounting and cost allocation, advantage of government borrowing and insignificant taxes, but on a basis comparable with private operation, there could have been very little justifiable complaint.

The limited yardstick advocated by Senator Pope is decidedly contrary to the garbled version presented by TVA to the Congressional investigating committee. Unless Senator Pope has completely reversed his viewpoints, he cannot be in harmony with Mr. Lilienthal. What does this mean? Does it mean that the President wants TVA to behave like a gentleman and cease its Fascist tactics? Does it portend other changes in the directorate?

Right now it's all a guess, but considering the relationship of TVA to the Administration and considering the President's views on public ownership and what he had done to promote it, the appointment to the TVA board of a man of Senator Pope's views cannot be considered an anti-private utility gesture.

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Wisconsin Again Shows the Way

MEN and governments being what they are, movement straight ahead is not always possible. Progress must be accomplished by tacking like a sailboat against the wind. Wisconsin now has pulled her rudder around and is leaving the port tack and turning to starboard, still making headway in the direction of progress. Recent events give us ground for believing that Wisconsin may perhaps be again showing the way to the other states and to the nation.

A few days ago some three hundred people sat at a luncheon table of sawhorses and boards to eat barbicued beef and beans from tin plates. And then with their feet numb from the cold concrete floor of the old power house at Grandfather Falls heard the Governor of Wisconsin say: "I want private enterprise in this state to have a free hand as long as the men running it are honest with their fellow men." These are like manna in the desert after hearing business, and especially utilities, accused so long of every crime in the calendar.

The occasion was the dedication and starting of the new Grandfather Falls hydro plant on the Wisconsin River, built by the Wisconsin Public Service Corporation. Commenting on the new plant, its construction started and carried to completion in adverse times, Governor Heil said: "I want to compliment these men who look ahead—like my friend John Pulliam here—who do things and make jobs. . . . If companies like this one can't make a fair return on the money they invest to make jobs, well, then, the boys and girls who work for these companies won't get on so well." Then, turning to the chairman of the state's Public Service Commission, present with his fellow members, the Governor added: "I want your commission to be fair to industry."

This is indeed good news. The quotationmarks can now be removed from around the word when progressive is used to describe Wisconsin. For progress is made by a free people working in freedom, a people who own the government, who are not owned by it.

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Electric Heat for Ceramic Firing

USE OF electrical heat in the ceramic industry began in this country as far back as 1909, when the Journal of the Ceramic Society reported a porcelain kiln for 1,500 degrees C. operation. Nevertheless, despite the European feeling that our energy rates are more conducively lower, it does not appear that we have been making the progress that is being made all over Europe to supplant fuel-fired kilns for the sake of the superior results obtainable electrically. Two papers presented recently in ceramic circles in Germany and France (by Dr. A. Rittgen and Messrs. Seuche and Hugot, respectively) attest the successful spread of the program abroad.

Especially is the tunnel type of kiln making progress because it offers most economical and efficient use of heat energy, especially for the larger units running up to 500 and 600 kw. of input. It fits nicely the trend toward using the continuous flow of the conveyor as used for other movements of materials and products in modern industrial plants. It produces glazed materials without muffling of flames or enclosure of the product. Dr. Rittgen goes so far as to call the control of operation in the electric tunnel kiln so nearly ideal as to constitute an "automatic conscience". Temperature distribution is superior because the metallic and carborundum resistors can be disposed to attain best results. Sparks and fumes are eliminated and rejects, the bane of the ceramic industry, are reduced to very small percentage. From the power standpoint the load is advantageous because it has good load and power factors.

Here then is a potential load which could be given more sympathetic attention in areas where the kaolins abound and the fine ceramic industry is naturally centered. Rates must be low but need not compete with fuels on a price basis entirely when consideration is given to the pecuniary gain from savings in operation and from bettered product with fewer discards. Electric heating elements are at hand to meet the high temperatures demanded. The main obstacle is possibly inertia and adherence to traditional ceramic technique.

Certainly in territories where hydro is available in unabsorbed quantities it would appear fruitful to encourage the experimentation which in Europe has expanded usage which means something like a ½ kilowatt-hour for every pound of product.

News OF THE WEEK

Narragansett Electric Makes Bid for Newport Electric Properties

President Moore says offer has been sent to trustee of Utilities Power & Light to purchase the Newport company — Reveals that if purchase is made the new system will operate as division unit

The Newport (R.I.) Electric Corp., owned subsidiary of the Utilities Power & Light Corp., will enter the New England Power Association system if a purchase offer is accepted and then approved by the necessary public authorities.

Samuel C. Moore, president of Narragansett Electric Co., Providence, one of the principal operating properties of the association, announced that he had recently made an offer to Charles T. Adams, trustee in bankruptcy of the Utilities corporation, for the acquisition of the Newport company, the terms of which, however, were not available at that time. The Newport company has $1,191,000 in common and $1,026,800 in 6 per cent preferred stock outstanding.

Has 12,000 customers

George W. Michael, general manager of the Newport utility, stated that the property has about 12,000 customers, a gross annual revenue of about $800,000 and an annual energy output of approximatey 17,500,000 kw.-hr., of which about 6,000,000 kw.-hr. was purchased last year.

The generating plant consists of two 3,500 kw. Westinghouse steam turbine units and two Riley boilers rated each at 60,000 lb. of steam per hour at 450 lb. pressure, oil burning. The system peak was 4,750 kw., last year, occurring on Christmas Eve. Three-phase, 2,400-volt distribution is used. A two-circuit, 23-kv. overhead tie line 18 miles long connects the system with Fall River Electric Light Co., an affiliate of the New England Power Association. The S.E.C. and Rhode Island commission will pass upon the offer if accepted on behalf of the Newport property.

Mr. Moore stated that if the offer is accepted the Newport property will be operated as a Newport County division of the Narragansett company. This will preserve its local identity and give the public the benefit of rate reductions established and contemplated in the future by Narragansett in metropolitan Providence.

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Iowa-Nebraska Sale Authorized by FPC

FPC has approved the disposition by Iowa-Nebraska Light & Power Co. to the Central Nebraska Public Power District and the Loup River Public Power District of its electrical facilities in Nebraska which are subject to the jurisdiction of the commission. In its order of approval the commission pointed out that the application did not involve exercise of its jurisdiction with respect to the financing or the issuance of the securities described.

The company's facilities in the territory south of the Platte River in Nebraska, known as the "central division," are to be sold to the Central Nebraska District for $17,370,112, exclusive of such sum, not exceeding $450,000, as may be paid for accounts receivable, and its facilities north of the Platte River, known as the "Loup Division," are to be sold to the Loup River District for $2,825,879, exclusive of such sum, not exceeding $120,000, which may be paid for accounts receivable.

For the purpose of financing the properties it will acquire and for other purposes, the Central District proposes to issue revenue bonds in the aggregate sum of $21,500,000, and the Loup River district to purchase the properties it will acquire and for other purposes proposes to issue revenue bonds in the principal sum of $5,000,000.

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Memphis Makes Offer for Utility System

Resumption of negotiations between the city of Memphis and Memphis Power & Light Co., looking toward the purchase by the city of the electric and gas properties of the utility, has resulted in a new offer by the city of $18,127,000, as compared with offer of November 30 of $17,385,000.

At the conference this week the utility offered to sell its properties for $21,000,000, but this was rejected.

Officials of the company asked the city to put its new offer in writing as it included $330,000 worth of transmission lines not covered in the November bid.

The city of Memphis sold this week $1,000,000 general liability electric plant 18-year serial bonds to a syndicate headed by the Mercantile Commerce Bank & Trust Co., St. Louis. These bonds, bearing interest at the rate of 2.40 per cent, premium $500, will yield 2.395.

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New York State Control of Water Power Again Sought

Development of the water-power resources of the Niagara and St. Lawrence rivers under state ownership and control was again urged by Governor Lehman of New York in his annual message to the Legislature last week. A proposal embodying these principles was defeated in the constitutional convention last year.

Governor Lehman also recommended that submetering companies be placed under the jurisdiction of the Public Service Commission, that utilities be

required to show depreciation currently on their books and that they be prohibited from keeping any accounts or records other than those prescribed by the commission or by the federal government. He also said that public utilities should be required to give the consumer the proper rate for his requirements, rather than to leave the choice of rate schedule to the user.

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Asks Rehearing on Rates of Philadelphia Electric

Contending that the Federal Power Commission erred in its findings dismissing his petition against the Philadelphia Electric Company, H. Jerome Jaspan of Philadelphia has filed with the commission a petition for rehearing.

Mr. Jaspan charged that the Philadelphia utility sold to its affiliate, Delaware Power & Light Co., at 4.9 mills per kw.-hr., energy which cost approximately 1.5 cents to produce, thereby imposing an undue burden on Philadelphia consumers, who pay an average residential rate of about 5 cents.

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La Plata Plant in Service

After four years' delay because of the opposition of the Missouri Power & Light Co., the new $104,000 municipal light plant at La Plata, Mo., is now in operation. Construction of the plant was made possible by a PWA grant of $29,000 and a bond issue of $75,000 by the city.

Wisconsin Public Service Opens New Hydro-Electric Power Plant

Governor Heil praises work of utility as Grandfather Falls project is dedicated — Tells state commission to be fair to industry and investors — Officials and public attend dedication ceremony

Asserting his faith in individual effort, in the profit system and in the greater social benefits of private enterprise as against socialistic ideas, Julius P. Heil, Republican Governor of Wisconsin, who took office only three days earlier, said, as principal speaker at the starting and dedication of the Grandfather Falls hydro plant of the Wisconsin Public Service Corp. January 4, that he had seen no electric utility in the state that had not sincerely tried to treat its customers fairly and honestly.

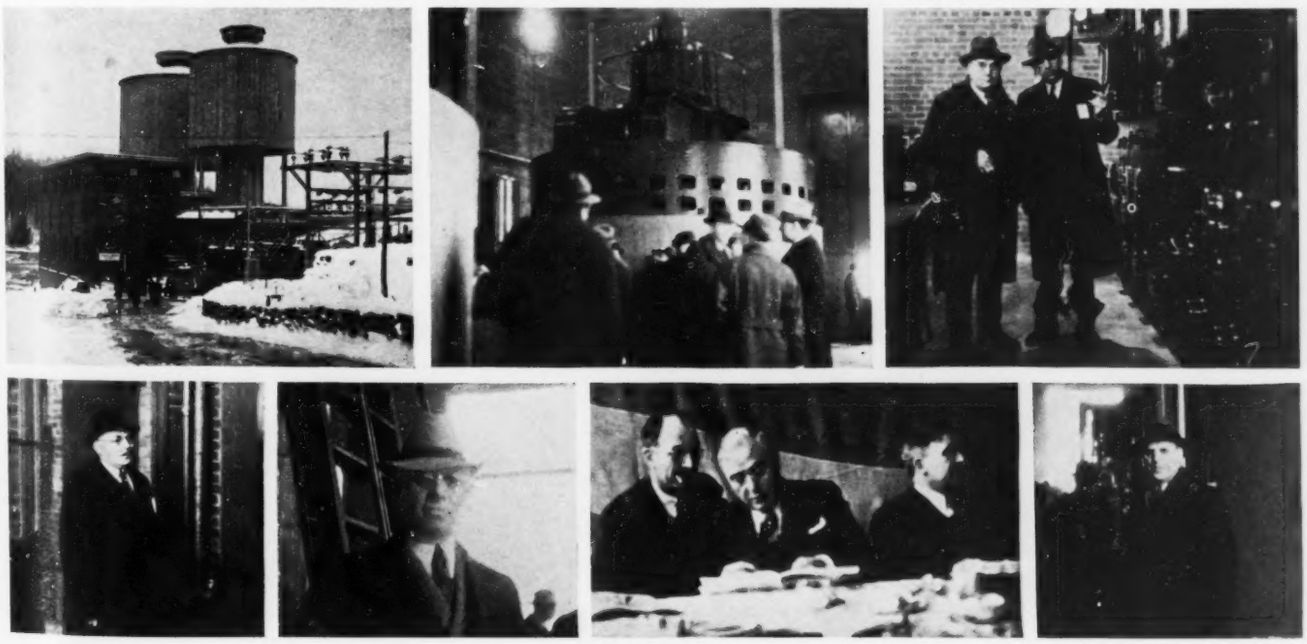
Will attract industries

Governor Heil told the members of the Wisconsin regulatory commission there present that he wanted them to be fair to industry and to the people who risked their savings in industry. "Private industries," said Governor Heil, "should have a free hand as long as they are honest with their fellow men. And if they are not honest, I shall be the first to suggest means to make them so."

The Governor further said that if corporations are not allowed to earn a fair return on the money invested in them, then they cannot be generous to their employees, which is a necessary thing if labor is to receive the reward to which it is entitled and should have. He declared that during his term of office he would make every effort to attract industries to Wisconsin in the hope that the people of the state might have fruitful employment. Specifically he deplored the fact that Westinghouse, one of the suppliers of equipment for the new Grandfather Falls plant, once had had a factory in Wisconsin, but had moved out of the state. He promised that he would do his best to get this company back.

Governor Heil adverted to his own early association with Otto and Herman Falk as he commended the Allis-Chalmers Co. for its great contributions of employment and faith in Wisconsin during the recently past and present trying times.

"We admire your stand," said Mark R. Byers, managing editor of the Wausau *Record-Herald*, speaking as a representative of the public at large, as he recognized the way in which the



DEDICATE PLANT—Gov. Julius P. Heil of Wisconsin praised the fine work of Wisconsin Public Service at the dedication of its new Grandfather Falls hydro project. Top, l. to r.—The new plant, surge tanks and output substation; crowd inside the plant; Gov. Heil, A. G. Carson, chief engineer. Below—L. E. Bogen, Allis-Chalmers; R. M. Howard, vice-president of Mississippi Valley Public Service Co.; Mr. Carson, Governor Heil and J. P. Pulliam, president Wisconsin Public Service, and H. G. Roby of Public Utilities Engineering & Service Co.

electric utilities have stood up and continued to render better and better service under the attacks of government.

Mr. Byers said he realized that Wisconsin had been a hotbed of inspired anti-utility feeling, but he was sure that a marked swing over to the utility side was now manifest.

D. C. Everest, president and general manager of the Marathon Paper Mills Co., one of the largest paper producers in the nation, said that when men make money for themselves they cannot help but make profits for everybody. He complimented the Wisconsin Public Service Corp. on the quality of its service and thus inferentially the whole electric utility industry. He said that the "lambasting" of the utilities by the politicians was no longer popular with the people. But, said Mr. Everest, as he lauded the courage of the electric utilities in adverse times, referring to the undertaking of the Grandfather Falls project under an unsympathetic, not to say hostile, state administration, the utilities have not "tooted their own horn enough," have not informed the people of the cost and of the effort which make electric service possible all day every day of the year.

Pulliam at dedication

Presiding at the dedication was J. P. Pulliam, president of the Wisconsin Public Service Corp. He introduced A. G. Carson, his chief engineer, who told about the construction of the new plant with its 90-ft. head and two units totaling 17,000 kw. Also, he introduced C. R. Phenicie, vice-president, who, in describing the position of the new capacity in the system, emphasized that no gifts or grants from any source were helping to pay its cost and that the value of the Grandfather Falls development was wholly dependent on the complementary provision of steam generation capacity in the system.

Mr. Phenicie pointed out that the "average haul" per kilowatt-hour in the Wisconsin Public Service system was only 47 miles, much less than the hundreds of miles of transmission necessary in government's airy schemes of utilization of the power of falling water.

About 300 interested citizens, officials of cities and towns in the Wisconsin Public Service territory, state officers and representatives of the local and national press braved the 40 miles of sleety roads from Wausau up into the winter wonderland of Wisconsin in order to look over the new plant and to participate in its dedication.

•

Visit Commonwealth Home

Four hundred thousand persons have now visited the Commonwealth Edison Co. Golden Anniversary Electric Home.

Electric Rate Series Assailed by Maltbie

Sharp issue was taken by Milo R. Maltbie, chairman of the New York Public Service Commission, with the recent survey by the Federal Power Commission of electric rates in New York. Mr. Maltbie described the survey as "out of place" because it failed to take into consideration different conditions and costs which are the determining factors in rate schedules.

The "1938 Rate Series" of the FPC shows that the lowest rates for residential electricity in New York communities of less than 50,000 population were charged by municipally owned plants. The FPC makes no comment on the rate schedules as printed, nor to determine their reasonableness.

Mr. Maltbie said that "any and all comparisons of electric rates are wholly out of place unless, in the areas compared, it is true that conditions are substantially similar. The courts have held that they will not receive and will not allow the Public Service Commission to use comparative rates unless and until it has been shown that the conditions in the area are similar."

It was pointed out by Mr. Maltbie that in New York State the taxes paid by the different utilities vary widely, which makes for a difference in rate schedules. He said that one company is paying 28 per cent of its gross revenue in taxes. In other places taxes are less.

•

Authority of Power Board Challenged by Utility

Pennsylvania Water & Power Co. has challenged the jurisdiction of the FPC over the company's Holtwood Dam on the Susquehanna River. Company officials said the commision had no authority over the project, built ten years before the creation of the regulatory body, because the dam was on an unnavigable portion of the Susquehanna.

Charles Markel, company counsel, asked dismissal of the proceedings. He said the evidence was "irrelevant, immaterial and incompetent to support the claims."

•

Montana Power Hearing Set

On request of the applicant filed November 4, 1938, the FPC has ordered that a hearing be held January 25 on the application filed November 20, 1936, and later supplemented by Montana Power Co. for license for a transmission line between its Thomson Falls power plant and Anaconda substation in Montana.

The company contends that the line should be separately licensed as Project No. 1407, while the commission's view is that it should be included in the license for the Flathead project, designated as Project No. 5-Montana in the commission's records, license for which was transferred to Montana Power Co., which completed this large power plant on Flathead Lake and River in Montana.

•

TVA Rural Credit Contracts Approved

The Federal Power Commission has granted the applications of the TVA for approval of contracts with the Southwest Tennessee Electric Membership Corp. and the Gibson County Electric Membership Corp., providing for an extension of credit by the authority to the two membership corporations for the purpose of acquiring and interconnecting certain facilities now owned by West Tennessee Power & Light Co.

The order states that upon the basis of estimates submitted and testimony adduced on behalf of the applicant the sufficiency of the revenues anticipated from the operation by the two electric membership corporations, respectively, of their present properties and the facilities to be acquired and constructed to enable them to repay the principal, with interest, of the amounts to be borrowed from the authority within a reasonable period appears to be reasonably well shown.

The contract with the Southwest Tennessee Electric Membership Corp. provides for an extension of credit of $233,760 and the contract with the Gibson County Electric Membership Corp. provides for an extension of credit of $38,740. The contracts provide for an interest rate of 3½ per cent per annum, payable monthly.

•

Rivers-Harbors Bill May Include Power Projects

A rivers and harbors bill which would include a number of "combination waterway improvements and hydro-electric developments" was seen last week as "important" legislation to be passed by the present session of Congress.

Representative Joseph J. Mansfield, Democrat, of Texas, chairman of the rivers and harbors committee, added that "the national aspect of the proposed improvements is indicated by the fact that projects under consideration involve construction in 30 or more States and affect indirectly every state in the Union."

New Jersey Public Service Plans $23,500,000 Program of Building

Budget for 1939 calls for construction of 100,000-kw. turbo-generator and two boilers for Burlington station — Project to cost $12,000,000 — Gas and electric distribution systems to be expanded

Construction expenditures approximating $23,500,000 have been budgeted for 1939 by Public Service Corporation of New Jersey. The entire amount will not be spent during the year, but the appropriation will enable the starting of new projects which will require more than a year to complete.

The largest item in the construction program is the plan to install a 100,000-kw. turbo-generator and two boilers at the Burlington generating station of Public Service Electric & Gas Co. This project will be placed in operation in 1941 and is expected to cost $12,000,000.

Distribution circuits

More than $2,000,000 will be spent for installing and reinforcing distribution circuits and for continuing the placing of electric transmission lines underground.

About $1,000,000 will be spent to modernize the Marion generating station switch-house and $300,000 for additional transmission facilities for the Elizabeth district service. New electric distribution headquarters in Elizabeth will be built and an extension made to Hillside substation. City Dock substation, Newark, will be reconstructed.

The New Jersey utility system will also make extensive improvements to its gas supply. The gas department will increase the capacity of Central Gas Works, Raritan, from 4,000,000 to 10,000,000 cu.ft. daily. A 24-in. gas main between Belleville and Montclair will increase the supply in Montclair, Bloomfield, Glen Ridge, Verona and the Caldwells. More than $4,000,000 will be spent for gas and electric service extensions for new business and for minor improvements.

•

Preparing for Bids on Bonneville Line

Bids for the erection of the "backbone" transmission line from Bonneville Dam to the Vancouver, Wash., substation—the first major construction job of the power network—will be called for within a few days, Administrator J. D. Ross announced last week.

Erection of 374 steel towers, ranging in height from 42 to 70 ft., and the stringing of the 219 miles of steel-reinforced aluminum cable will be done on a contract basis, according to Charles E. Carey, principal construction engineer. The government will furnish towers, conductors and insulators, he said, and added that completion of the first of the two lines on the 220,000-volt, three-phase twin circuit would be required by September 1.

With the deposit last week in United States District Court of a check for $122,518, covering payment for the line's right-of-way between Vancouver and the Clarke-Skamania county line, way was cleared for final action in the building of the line. Similar action had been completed previously for Skamania County. An order from Federal Judge Cushman gave the project the right to immediate possession of the property along the route, but residents are to be given until April 1 to vacate their homes.

FIELD GANG—Taunton (Mass.) municipal light system is rushing work on its new underground conduit line from the steam plant to the industrial-business area

•

New Rural Service Planned in Indiana

Central Indiana Power Co. has petitioned the state Public Service Commission for approval of a $430,000 rural electrification project which would bring electric service to 2,000 farm families in ten counties. The company would borrow funds for construction of 500 miles of new lines from REA, issuing collateral notes at 2.73 per cent, and pledging first mortgage collateral and refunding bonds as security. Construction would be in ten counties not now served.

The program has been approved by popular vote of potential customers. Release on the territory by other utility groups has been agreed upon. Rates for residential and commercial service follow those of REMC units. Top step of residential rate is 7.5 cents per kilowatt-hour for the first 30 kw.-hr., 5 cents per kilowatt-hour for the next 30 kw-hr., 3 cents per kilowatt-hour for the next 170 kw.-hr. and 2.5 cents per kilowatt-hour for all over 230 kw.-hr. in one month. A minimum charge of $3 a month for the first five years of service is provided, then the monthly minimum would drop to $1.50.

•

Taunton Pushes Duct Work to Guard Service

Rapid progress is being made by the Taunton (Mass.) municipal lighting department in the construction of about 2 miles of main underground conduit line between the Water Street steam plant and the industrial-business districts at present served by a somewhat exposed overhead line.

Cable designed to operate at 25 kv. ultimately is now being purchased under bids submitted by manufacturers to the department and Arthur L. Nelson Engineers, Boston, in charge of the construction.

Extensive lateral cable lines form a part of the project and some 50 manholes are scheduled for construction, designs providing for future connections to underground transformer vaults when required. A maximum force of about 300 men is now at work, following an intensive production schedule.

Central Maine Power to Complete Project

Central Maine Power Company's growth in output in the closing months of 1938 led the management to authorize building the power house and installing one unit of about 7,000-kw. rating at the Solon Dam on the Kennebec River.

In a statement, President Walter S. Wyman announced that a contract has been made with the Sanders Engineering Corp. which contemplates finishing the plant before September 1, next, the dam having been practically finished since work began last August. The project represents an ultimate outlay of about $1,390,000. The completion of work already done required approximately $850,000.

The company will require about $5,000,000 from outside sources to finish the Solon plant and pay off bank loans and first mortgage bonds due next November, President Wyman states. A plan has been laid out to secure these funds by issuing and selling $500,000 par value of the company's common stock and $4,500,000 par value of its first and general mortgage bonds.

The directors of the New England Public Service Co., which owns practically all of Central Maine's common, have approved this procedure and have advanced $500,000 to the operating company with repayment right at $100 per share. The Maine commission and the SEC at Washington have been petitioned to approve the required security issues, and if these sanctions are given the company will be freed of short-term debts and left with no sizable maturities until 1960.

•

Illinois Utility Plans Guard Against Flood

Illinois Northern Utilities Co. is engaged in six construction projects in and near Sterling which will provide greater protection against flood damage to facilities. The projects will provide more capacity for customers.

An outdoor steel substation is being erected at the lower hydro plant which will connect with the 132,000-volt line extending to Sterling from Dixon. This will provide an additional source of power to the local system and increase its capacity 7,500 kva.

The new station will contain four 132,000/33,000-volt transformers, one of which will be a reserve unit.

Two reinforced concrete sea walls are being constructed to protect facilities against flood. Other construction jobs will provide steel towers for transmission lines extending west from Sterling. Nine towers, supporting two 33,000-volt circuits, are being erected from the Sterling lower hydro plant, part of a loop providing two way service to Morrison, Lyndon and Prophetstown.

•

Pact Settles Rural Dispute in Georgia

A plan to eliminate duplication of rural electric service in seven northwest Georgia counties by Georgia Power Company and the North Georgia Electric Membership Corporation, which uses TVA energy, was approved last week by the Georgia Public Service Commission.

Under the plan the NGEMC will confine its operations to the rural sections of the specified area and the power company will withdraw from rural electric service in that area, with certain exceptions, but will continue to supply municipalities and industries. The utility will sell 132 miles of rural line to the co-operative for $158,750 and will remove 49 additional miles which parallel the agency's lines. It will continue to serve customers within 800 feet of the rural lines it retains.

The agreement brings to an end a controversy between the power company and the co-operative dating back to 1936, when the co-operative, organized under the Rural Electrification Act, constructed an extensive rural electric system.

Preston S. Arkwright, president of Georgia Power, saw the agreement as a peaceful settlement of the controversy and added "we are not withdrawing from business in northwest Georgia. We are withdrawing only from certain rural areas where there is duplicate service, and we will continue doing business as at present in the rest of the section."

•

Asks Permit for Hydro Unit

Swanson Mining Corp., Salyer, Calif., has filed with the FPC its application for a license for a constructed power plant with a capacity of approximately 2,140 hp., on Campbell Creek in Humboldt County, Calif., affecting lands of the United States in the Trinity National Forest. The project, which is constructed, includes a power house having installed capacity of about 2,140 hp. and 1.08 miles of transmission lines connecting the power house with the applicant's pump houses. The energy generated by the project is used for mining purposes.

Boston Suburb Opens New Street Lighting

Milton, Mass., attractive residential suburb of Boston, sensed the value of improved street lighting sufficiently after the hurricane last September to devote money savings from interrupted service toward modernization of facilities in the Brook Road district.

The Boston Edison Co. deducted outage time from the town's bills, and while the sum involved was not large, the selectmen turned it to good account in equipping this district with eleven 600-cp. multiple lamps as a starter in a general betterment program.

About 1,500 ft. of street have been equipped, doing away with an older installation of 80-cp. series lamps spaced about 400 ft. apart and mounted 18 ft. above the highway. The street is about 100 ft. wide over all and 60 ft. wide from curb to curb.

The new units are 150 ft. apart on staggered spacing, mounted about 20 ft. high on 6-ft. mast arms and equipped with reflector-refractor light diffusers. General Electric supplied them, and the result is increased brightness of road surface, with virtual elimination of glare.

An early extension of the installation is planned by the town.

•

Senator Pope Appointed to Succeed Dr. Morgan on TVA

President Roosevelt last week appointed Senator James P. Pope of Idaho as a member of the board of directors of the Tennessee Valley Authority. Mr. Pope succeeds Arthur E. Morgan, former chairman, dismissed by the President, and will serve the unexpired part of a nine-year term dated from May, 1933.

It is generally believed in Washington circles that the Senate will confirm the appointment, although Senator Bridges of New Hampshire has opposed it on the ground that no vacancy exists. He said he intended to present information in support of the contention that the President removed Dr. Morgan illegally. Dr. Morgan is contesting the removal order in court.

•

Permits Sale of Lines

Sale of the power and transportation lines of the Cincinnati & Lake Erie Interurban Co. from the Medway power station to Summerford, near London, Ohio, to the Ohio Edison Co. for $29,000 has been authorized by Judge R. R. Nevin, in the U. S. Court at Dayton, Ohio.

Output Rises in Year's First Week

Output of energy by the electric light and power industry was greater in the first week of the new year than in the final one of the old, although each contained a holiday. As reported by the Edison Electric Institute production was 2,169,470,000 kw.-hr.; the increase was nearly 49,000,000 kw.-hr., or about 2.3 per cent.

Comparison with the corresponding calendar week a year ago, ended January 8, would indicate a gain of only 1.4 per cent. This, however, understates the improvement. If the week of January 1 is used, so as to include the holiday, the gain is 8.5 per cent.

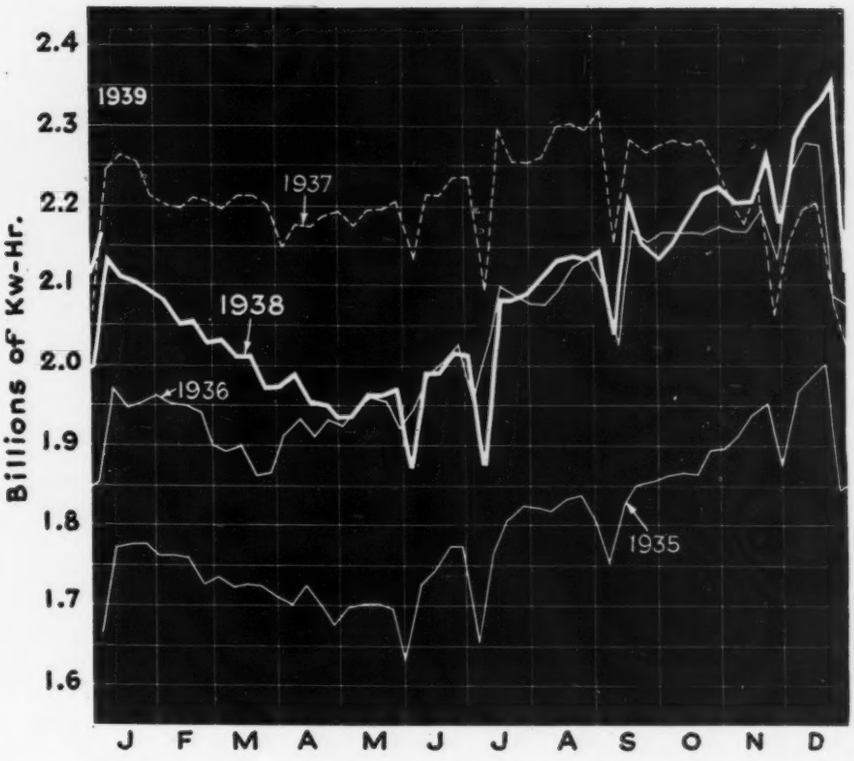
Similarly as to 1937, the comparable week is the one ended January 2, not January 9; on that basis present operations are higher by 100,000,000 kw.-hr., or 5 per cent. More conclusive comparisons will be possible next week, when no holidays will be involved, but indications continue to point to a larger output than in any former year.

Weekly Output, Millions Kw.-Hr.

1939	1938	1937
Jan. 7..2,169	Jan. 8..2,140	Jan. 9..2,244
	Jan. 1..1,998	Jan. 2..2,069
1938	1937	1936
Dec. 31..2,121		
Dec. 24..2,363	Dec. 25..2,085	Dec. 26..2,081
Dec. 17..2,333	Dec. 18..2,202	Dec. 19..2,275
Dec. 10..2,319	Dec. 11..2,196	Dec. 12..2,278
Dec. 3..2,286	Dec. 4..2,153	Dec. 5..2,244

Per Cent Change from Previous Year

Region	Week Ending Jan 7	Dec. 31	Dec. 24
New England	Data not comparable	Data not comparable	Data not comparable
Middle Atlantic			
Central Industrial			
West Central			
Southern States			
Rocky Mountain			
Pacific			
United States	+ 1.4	+ 6.1	+13.3



Canadian Hydro Plan Finishes Second Step

Power development of the Montreal River in Ontario, Canada, by the Great Lakes Power Company ended its second stage recently when the Lower Falls plant, 200 ft. head, 9,000 kva., which is located near the mouth of the river, north across Lake Superior from Sault Ste. Marie, went into operation at the end of 1938.

About a year earlier the Upper Falls plant, 10,000 kva., 15 miles upstream, was completed.

Practical doubling of the capacity at both plants is possible by water availability and provisions of space in the stations for future units and of means for raising heights of dams. The contemplated ultimate development of 50,000 hp. might be increased to 60,000 hp. if the economics of future conditions justify such addition.

•

Appeals Rate Ordinance

Ohio Public Service Co. has appealed to the state Public Utilities Commission from a five-year power rate ordinance approved by the Sandusky City Commission. The utility contends rates fixed by the ordinance are confiscatory and provide insufficient compensation. Pending hearing of the appeal the company will continue to charge its present rates under bond of $60,000.

•

Sells Utility Facilities

West Tennessee Power & Light Co. closed this week the deal to sell its electric system serving 22 communities for $1,600,000.

•

EHFA Closes New Contracts for Appliance Financing

Electric Home and Farm Authority has recently closed contracts with the Franklin Rural Electric Coop., Hampton, Iowa; Anoka County Coop. Light & Power Association, Anoka, Minn.; Board of Public Utilities, Paris, Tenn., and Wisconsin Hydro-Electric Company, Amery, Wis. The contracts provide that the EHFA and the utilities will cooperate in financing the sale of electrical appliances for use by consumers on the utilities' power lines.

An additional contract with Wisconsin Hydro-Electric provides for cooperation between the utility and EHFA in financing the wiring or rewiring of existing homes and farms on the utility's power lines.

•

Plans Issue of Notes

Central Ohio Light & Power plans to issue $127,923 in notes to finance the installation of a 5,000-kw. generator in its new plant at Bluffton. The Ohio Utilities Commission has authorized the company to extend to January 30 the time for issuance of the notes.

•

Associated Hearing Set

A hearing has been called by the SEC for January 23 to determine whether Associated General Utilities Co. should be declared a subsidiary of Associated Gas & Electric Co. and Associated Gas & Electric Corp.

•

Georgia Power Sales

Merchandise sales of Georgia Power Co. for the first eleven months of 1938 totaled $1,701,419, or 81.9 per cent of quota. During November merchandise sales totaled $147,294.

N.E.M.A. to Hold Meet in New York Feb. 6-10

A strong belief that business revival will continue is indicated by the great interest being shown in the coming midwinter conference of the National Electrical Manufacturers Association, to be held at the Waldorf-Astoria Hotel, New York, February 6-10. A total of 108 separate meetings have been scheduled.

Plans for the conference are nearing completion and a complete program is to be sent to all N.E.M.A. members in the near future, it was announced. One of the features on the program will be the annual dinner.

Blackwell Smith, of Wright, Gordon, Zachry & Parlin, will address the policies division Wednesday afternoon on "Economic Inquiry, Trade Associations and Prosperity." Following will be A. D. Whiteside, president of Dun & Bradstreet, with an address on "Is Industry on the Spot?"

•

Texas Utility Ready to Sell System to LCRA

Last week Jesse Jones, chairman of the RFC, announced that the corporation had conditionally approved a loan of $5,000,000 to the Lower Colorado River Authority to finance the purchase of the electrical plant and facilities of Texas Power & Light Co., controlled by American Power & Light.

Last November the LCRA rejected the offer of the utility to sell the electric properties for $7,398,016. These included ice and water facilities. Max Starcke, manager of the authority, stated that the LCRA was willing to pay only $4,000,000. The utility's offer was subsequently reduced to $6,584,577, eliminating ice and water properties. Reports this week indicated that the utility is now willing to sell for a minimum of $5,000,000.

•

Get Free Service as Gift

Free electric light was again authorized by the City Council at Grand Forks, British Columbia, for the period from December 23 until December 28. This Christmas gift followed a practice inaugurated the year the hydro plant was completed.

•

Utility Attacks NLRB Order

Consumers Power Co. has filed a petition with the U. S. Circuit Court of Appeals at Covington, Ky., asking that the court set aside a National Labor Relations Board order holding the company guilty of unfair labor practices. The petition denied that the company had committed any unfair labor practice and charged that the board's order was based on "no substantial evidence." The company contended that the board had no jurisdiction in the case and insisted that the NLRB had not granted "a fair and impartial trial."

•

PUAA Announces Program for Western Conference

Announcement has been made that the Public Utilities Advertising Association will hold its first western regional conference at the Hotel Muehlebach in Kansas City, Mo., on January 31. "What the PUAA Is and What It Has Done" will be discussed by William H. Hodge of Chicago and by Jay C. Barnes, New Orleans Public Service, Inc. Howard F. Weeks will speak on "The PUAA Objectives."

Meetings

Canadian Electrical Association—Mid-Winter conference, Windsor Hotel, Montreal, January 16–17. B. C. Fairchild, secretary, 804 Tramways Bldg., Montreal, Que.

Missouri Valley Electric Association—Power Sales conference, Omaha, Neb., January 19–20. I. D. Pettegrew, acting director, Lincoln, Neb.

American Institute of Electrical Engineers—Winter convention, New York, N. Y., January 22–27. H. H. Henline, national secretary, 33 West 39th Street, New York, N. Y.

American Society of Heating and Ventilating Engineers — Annual meeting, Pittsburgh, Pa., January 23–26. A. V. Hutchinson, secretary, 51 Madison Avenue, New York, N. Y.

Public Utilities Advertising Association — Western regional conference, Hotel Muehlebach, Kansas City, Mo., January 31. Ray T. Ratliff, Kansas City Gas Co., Kansas City, Mo.

National Electrical Manufacturers Association — Mid-Winter conference, Waldorf-Astoria Hotel, New York, February 6–10. W. J. Donald, managing director, 155 East 44th St., New York, N. Y.

Edison Electric Institute—Prime movers committee, Pittsburgh, Pa., February 6–7; electrical equipment committee, Statler Hotel, Buffalo, N. Y., February 6–7; transmission and distribution committee, Sagamore Hotel, Rochester, N. Y., February 9–10. Bernard F. Weadock, managing director, 420 Lexington Ave., New York, N. Y.

Louisiana Engineering Society — Annual meeting, St. Charles Hotel, New Orleans, La., February 23–25. A. M. Hill, secretary-treasurer, St. Charles Hotel.

Oklahoma Utilities Association — Annual convention, Tulsa, Okla., March 20–21. Kate A. Niblack, secretary, 625–626 Biltmore Hotel, Oklahoma City, Okla.

Southeastern Electric Exchange — Annual conference, Ponce de Leon Hotel, St. Augustine, Fla., March 30–April 1. J. W. Talley, executive secretary, 308 Haas-Howell Bldg., Atlanta, Ga.

Oregon City Signs Up With Bonneville

The first contract for Bonneville power was executed last week, when the City Council of Cascade Locks, Ore., authorized Administrator J. D. Ross to deliver to the community an inital supply of 200 kw. for a period of 20 years.

The contract is dependent on the city's purchase of the distribution system of West Coast Power Co. By its terms the city will pay $17.50 per kw.-year for primary energy taken from Bonneville's transmission network. If it constructs its own lines to the power plant, a few miles westward, the city may buy the energy at the lower rate of $14.50.

Cascade Locks is to institute retail residential rates as set by Administrator Ross as quickly as possible. These rates are as follows: First 50 kw.-hr. a month, 2½ cents per kw.-hr.; next 150, 2 cents; next 100, 1 cent; next 1,700, ½ cent; excess above 2,000 kw.-hr. a month, ¾ cent per kw.-hr. A minimum monthly bill of 50 cents per meter is also specified.

The city has already approved an issue of $90,000 worth of revenue bonds to market the power and the City Council has approved issuance of a preliminary block in the amount of $79,000 for purchase of the utility's system and construction of new lines. According to an agreement recently reached between the city and West Coast Power, the city would pay the utility $44,000 for its transmission facilities. It was believed the city would acquire the property before April 1 this year.

•

Luckiesh to Address I.E.S.

Dr. Matthew Luckiesh, director of the General Electric lighting research laboratory at Nela Park, will talk on "Quality of Lighting" at a joint meeting in New York City of the New York section of the Illuminating Engineering Society and the American Institute of Electrical Engineers on January 17.

•

Power for Seminoe Dam

Power from the $20,000,000 Seminoe plant of the Kendrick project will be ready for distribution by next September, according to Commissioner John C. Page of the Bureau of Reclamation. Started in 1933, the Alcova Dam, one of the major structures, has been finished. A 33,000-volt transmission line, approximately 33 miles long, is now being completed from Seminoe Dam to Rawlins, Wyoming.

Bonds Higher in Week; Stocks Hold Level

50 Bonds
PRICE TRENDS OF ELECTRIC UTILITY SECURITIES
36 Common Stocks
36 Common Stocks
50 Bonds
85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10
110 100 90 80
1931 1932 1933 1934 1935 1936 1937 1938 Jan. Feb. Mar. Apr. May June 1939

Electric power and light common stocks maintained their level of the previous week, with the "Electrical World" index at 29.7; index a year ago, 27.9. Bonds bettered their position in the week, with the index rising 0.5 point to 103.7

SEC Orders Standard Gas Stock Deposit

Plan of recapitalization of the Northern States Power Co. of Delaware and applications concerning various transactions incident to such plan by its subsidiaries, the Northern States Power Companies of Minnesota and Wisconsin, have been approved by the SEC.

The plan includes a reduction in the class B common stock of the Delaware company from $7,291,663 to nothing, termination of the voting power of the class B common stock on January 1, 1941, and cancellation of the stock on January 1, 1944. The class A common stock would be reduced from $34,155,100 to $8,538,775.

One condition for approval of the plan follows:

That Standard Gas & Electric Co., a Delaware corporation, forthwith execute (with the blanks appropriately filled) an agreement to be entered into between said corporation and Wilmington Trust Co. of Wilmington, Del., in the form of the agreement heretofore submitted to this commission and made a part of the record in these proceedings, and deposit thereunder all shares of the class B common stock of Northern States Power Co., a Delaware corporation, owned by said Standard Gas & Electric Co.

•

North American Calls Meeting of Stockholders

Stockholders of North American Co. have been advised by James F. Fogarty, president, that a special meeting will be held January 30 for the purpose of considering the huge refinancing program planned and the elimination of North American Edison Co. as an intermediate holding company.

Stockholders will be asked to approve the $70,000,000 of new debenture financing and $34,829,000 par value of new 5¾ per cent preferred stock, as well as change the par value of North American common stock from no par value to $10 par value, the present stated value.

•

P. G. & E. Completes Simplification Plan

Transfer to the Pacific Gas & Electric Co. on December 31 of properties of its only remaining electric and gas subsidiaries, San Joaquin Light & Power Corp. and Midland Counties Public Service Corp., brought to a virtual conclusion an extensive program of physical integration of properties and simplification of corporate structure carried forward by the Pacific company for a number of years. The properties heretofore owned by these subsidiaries will now be operated as the San Joaquin Power division of Pacific Gas & Electric Co.

At a meeting of the board of directors of Pacific Gas held recently the by-laws were amended to remove the numerical designation of vice-presidents, and A. Emory Wishon was elected a corporate vice-president and assistant general manager of the company.

•

Bond Issue Placed Privately

Ottawa Valley Power Co.'s $7,500,000 first mortgage 4 per cent bonds priced at 103 have been placed privately. The company also is offering $2,500,000 twenty-year 5 per cent second mortgage debentures at 100, in exchange for part of outstanding debentures. Proceeds from the financing are to be applied to the retirement of the company's 5½ per cent first mortgage bonds due October 1, 1970, of which $8,956,500 are outstanding. These bonds have been called for redemption on January 30 at 104.

•

SEC Survey Covers Utility Financing

Electric and gas utilities offered 58 security issues totaling $952,952,995, against 46 issues totaling $664,304,635 in 1937, according to a survey by the Securities and Exchange Commission reported last week.

The survey, which covers the four-year period ended December 31, 1938, shows that of the 250 issues amounting to $4,079,095,581 offered in this period, only one offering was made by a holding company. It also shows that no common stocks have been issued since July 1, 1937, and in the four years covered only about one-fourth of 1 per cent of the four-billion-dollar total was in common stock issues.

More than 83 per cent of all issues were bonds, according to the report, and it is estimated that of these less than 10 per cent was for new capital. More than 90 per cent of the bonds issued were for refinancing in order to take advantage of diminishing rates of capital, average interest rates having declined from 3.88 per cent in 1938 to 3.57 per cent in 1938.

Bonds accounted for $680,707,000 of the 1938 total; of this amount, $680,407,000 was obtained at rates of from 3⅛ to 4 per cent, while only $300,000 worth carried a 5 per cent rate. The remainder of the 1938 issues was made up of $239,730,095 of debentures, $23,625,000 of notes and $8,890,000 of preferred stock. (For an analysis of electric utility financing in 1938 see pages 92 and 93 of this issue.)

Earnings Reports (Utilities)

	Net Income 1938	1937
†*Associated G. & E. and subs.	$34,974,869	$35,991,321
*National Pwr. & Lt. and subs.	8,617,126	8,911,362
*Cons. G.E.L. & P. (Balt.) and sub.	5,739,063	6,582,998
*Louisville G. & E. (Ky.) and subs.	2,597,606	2,726,072
*Pennsylvania Pwr. & Lt.	7,779,766	8,047,014
*Memphis Pwr. & Lt.	1,965,574	1,666,685
*Houston Ltg. & Pwr.	2,963,338	2,749,458
*Carolina Pwr. & Lt.	2,456,736	2,627,724
*Texas Pwr. & Lt.	1,992,016	2,113,786
*Minnesota Pwr. & Lt.	1,100,849	1,433,337
*Pacific Pwr. & Lt. and sub.	859,929	818,660
*Tennessee Pub. Serv.	419,311	460,475

*Twelve months ended November 30.
†Operating income (preliminary).

Field OPERATING PRACTICES

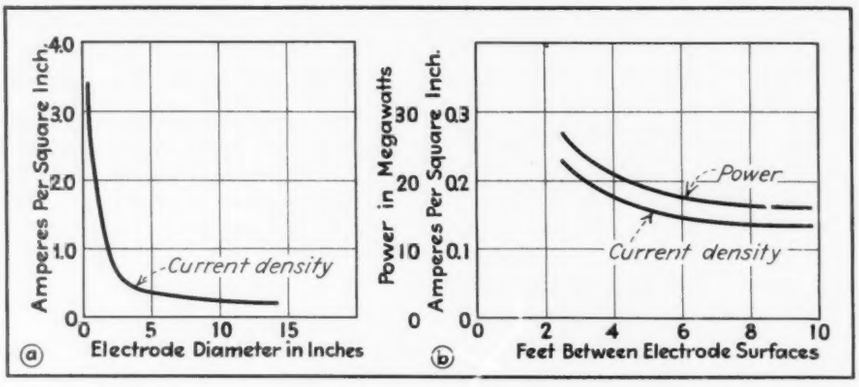
New ideas and practices in the operation of well-designed, constructed and maintained plants and systems

Bonneville Uses Water Rheostat

By RICHARD LAHUE EARNHEART
Corps of Engineers, U. S. Army,
Bonneville, Ore.

Most suitable water rheostat design evolved at Bonneville for testing the main units at loads up to 60,000 kw. proved to be a nine-electrode unit arranged as shown in the accompanying diagram. Nine 14¼-in. diameter electrodes were used, grouped three per phase with 30-in. spacing between phase surfaces.

In arriving at this design experiments were performed with three-electrode rheostats of various electrode diameters and spacings to determine the effect of these variables upon current density and power. Nature of the relationship between these factors is shown in the accompanying curves for Columbia River water having a resistance of 3,620 ohms per inch cube at 45 deg. F., 2,200 ohms per inch cube at 80 deg. F. (resistivity data taken in 1928).



Effects of electrode diameter and spacing on current density and power in water rheostat

(a) Effect of changing electrode diameter. Test made on three-electrode rheostat, 1 ft. immersion, 80 in. spacing between surfaces, 7,960 volts to neutral.
(b) Effect of changing electrode spacing. Test on three-electrode rheostat, 14¼ in. electrode diameter, 9.3 ft. immersion, 7,960 volts to neutral.

None of the experimental three-electrode units provided adjustment of a variable load up to 60,000 kw. together with freedom from arcing. Consequently the nine-electrode design was resorted to. This design yielded power-immersion characteristics shown. Tests on this rheostat may be summarized as shown in the table following:

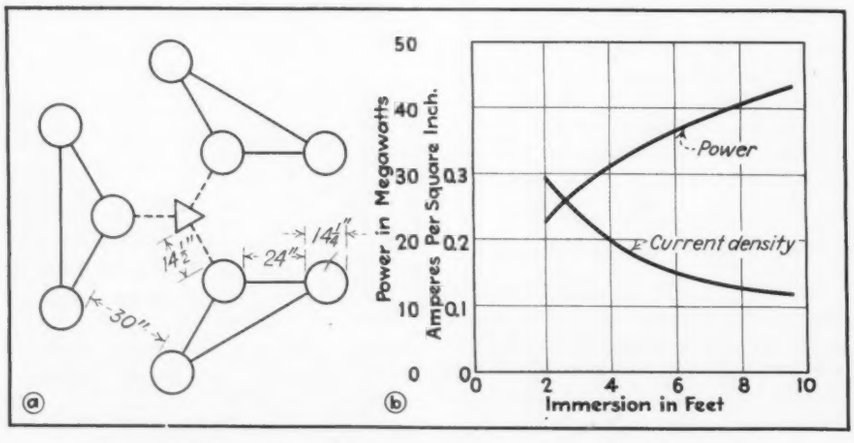
Power Kw.	Amperes per Phase			
15,600	605	600	600	Low
23,000	860	860	840	40
28,000	1,115	1,122	1,105	40
40,000	1,585	1,580	1,555	60

Neutral breaker closed, 7,960 volts to neutral.

All tests were made with the neutral breaker open except the one to provide the above data. The phase balance was practically the same with the neutral breaker open as that shown with the neutral breaker closed.

Changes in water temperature in these tests did not appear to have an important bearing on the immersion required. In one case no change in load took place in spite of the fact that the water became so warm that clouds of steam obscured the rheostat.

It was estimated that the temperature was 150 deg. 5 ft. from the rheostat.



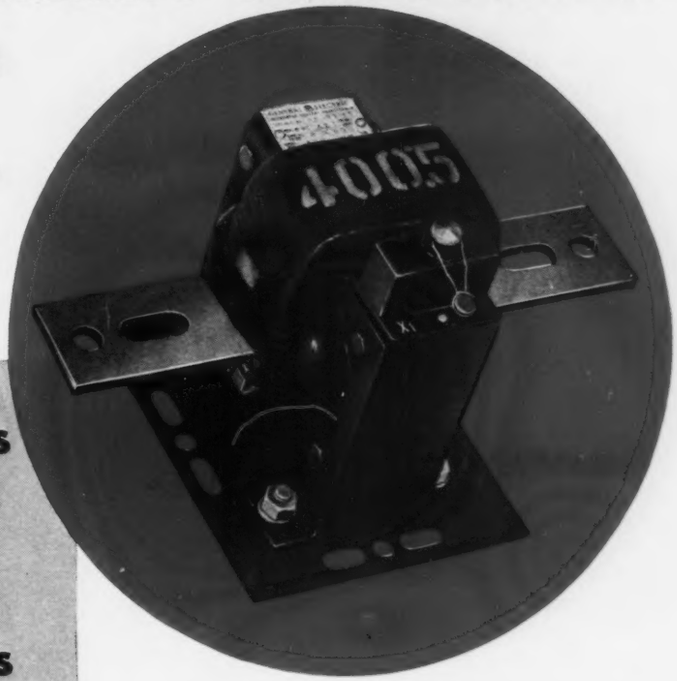
Bonneville uses nine-electrode water rheostat to test generators

(a) Arrangement of rheostat elements. (b) Rheostat characteristics—7,960 volts to neutral.

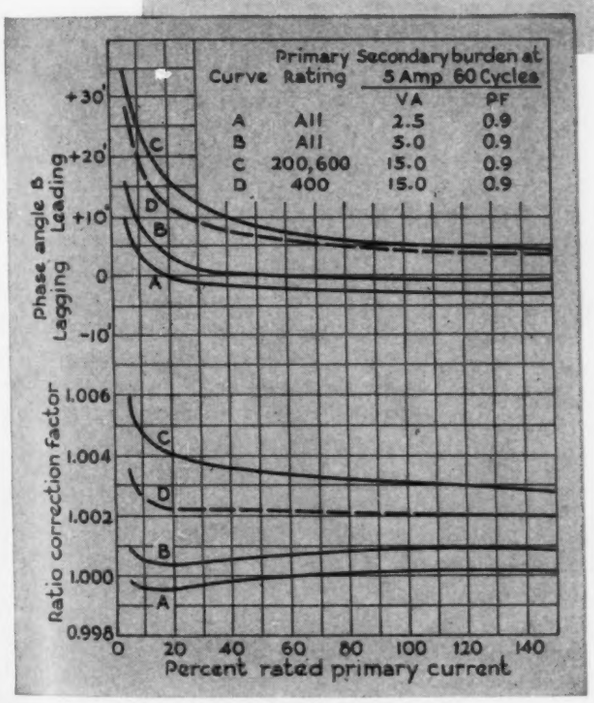
THESE NEW G-E METERING TRANSFORMERS

OFFER ADVANTAGES OF WIDE RANGE, ACCURACY, SIMPLIFIED STOCKING

Type JL-1 600 Volts
Three Ratings
200/5, 400/5,
and 600/5 Amperes



SMALL SIZE
HANDY SECONDARY TERMINALS
SILVER-PLATED CONTACT SURFACES



Ratio and phase-angle characteristics up to 150 per cent of primary-current rating.
Notice the outstanding accuracy of Type JL-1—particularly at the lower values of primary current. Such accuracy is obtained by means of the Wilson Compensation scheme—an exclusive G-E feature

WITH General Electric's new Type JL-1, you get a line of metering transformers designed to operate continuously at 150 per cent of their rated current—200, 400, and 600 amperes.

You get current transformers that provide maximum accuracy from 5 per cent to 150 per cent rated current. You benefit from reduced transformer stock. You profit from the ability of the JL-1 to serve a large variety of loads with few replacements.

This new, small-sized G-E transformer offers many advantages. Primary terminals are of the two-bolt-hole type, silver-plated to assure clean, noncorrodible contact surfaces. Solderless, clamp-type secondary terminals are provided, and a handy potential connector, on one terminal pad, eliminates the need for cutting into heavy cable. A detachable mounting plate makes it possible to minimize installation space—permits mounting on flat surfaces or pipe.

For a complete description of the new Type JL-1, call the nearest G-E office or write for Bulletin GEA-3095. General Electric Company, Schenectady, N. Y.

GENERAL ELECTRIC

420-52

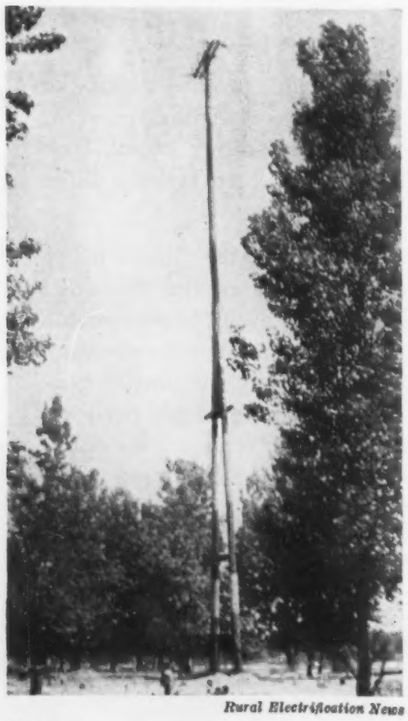
Crossing Structure Meets Flood Threat

Where the distribution lines of the Valley Electric Membership Corporation, Natchitoches, La., cross the Red River at Montgomery the combined threats of flood and quicksand have made special 95-ft. wood-pole crossing structures necessary.

The structures were located back from the river bank considerably to protect against erosion due to floods. This made an 860-ft. river crossing span necessary. Construction of the 95-ft. (out-of-ground) structure necessary to give proper clearance was complicated by the presence of quicksand near the river bank.

To keep the structures from sinking in the quicksand the poles are incased in creosoted cribbing composed of 30-ft. poles securely fastened to the structure butts. The structure is made of class 2 60-ft. poles joined by a wedge-type splice about 18 ft. over all. The top of the structure is guyed four ways by down guys and four similar down guys extend from the splice part way up the structure.

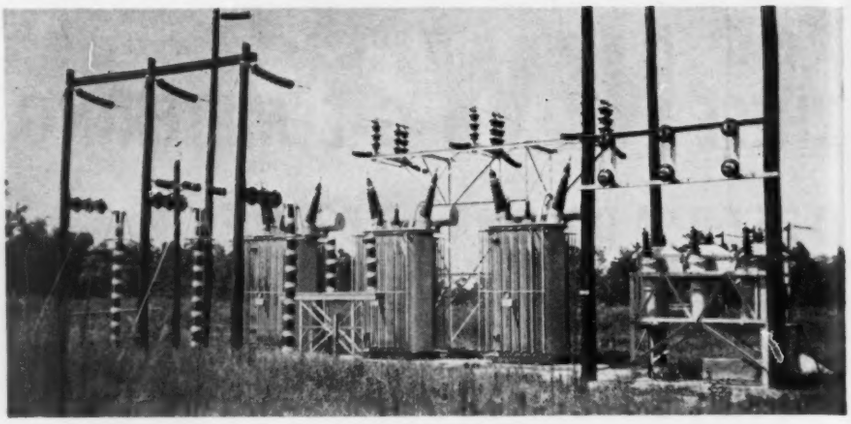
Special high strain insulators are used on the crossing side of the 10-ft. double arms, whereas ordinary type strain insulators are used on the land spans. Each structure is protected with special lightning arresters connected to the structure ground wire.



Rural Electrification News

95-ft. river crossing structure defeats flood and quicksand

Structure is painted black and yellow and lighted to conform to airway regulations.



EFFECTIVE SKELETON SUBSTATION PROVIDES STANDBY

Minimum requirements effectively satisfied at low cost mark the design of this new 114/44-kv. Orangeburg, S. C., substation of the South Carolina Electric & Gas Company. Tapping the 114-kv. line from Columbia to St. George, this substation affords a duplicate or back up 44-kv. service to the load center of the Columbia area, which is also served by a double 44-kv. circuit single-pole line. In fact, improved regulation by service through the new substation may cause it to become a main source instead of back-up. Equipment of the station includes three 1,667-kva., 114 to 44-kv. delta-wye transformers serving the 44-kv. single circuit through a 44-kv. automatic reclosing oil circuit braker. Necessary 114-kv. and 44-kv. lightning arresters and air-break switches are provided.

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Seal or Remove Vacant Premises Meters?

By KARL J. MERTZ
Superintendent of Electric Meters
Northern States Power Company,
St. Paul, Minn.*

When a premises is vacated the meter can be removed or it can be sealed and left. Which way is preferable? The answer depends on local conditions which control the cost of removing and reinstalling the meter compared to the fixed charges on an idle meter. In the Northern States Power Company, St. Paul division, the practice is to seal residence and other small single-phase meters and then to remove them if at the end of eighteen months the premises have not been reoccupied. The theory is that if a place stays vacant that long there is not much chance of a new tenant moving in.

We figure the average cost of a residence meter installed is $11.40. The cost of leaving the meter in for a year while the property is vacant consists of fixed charges plus the cost of reading the meter each month as a check against seal breaking and will average $1.38 a year. To remove the meter, shop-test and overhaul it, reinstall it and give it an installation test would cost approximately $1.75. Therefore, in the prospect of the premises being reoccupied within a year and four months the meter may remain in that long just on consideration of its own costs. There are also other things to be taken into account.

To prevent energy theft when a meter is taken out the service must either be disconnected at the pole or removed entirely. Removing a meter removes the excuse for an inspection inside the premises. We estimate the cost of disconnecting and reconnecting the service, removing and replacing the meter to amount to $6.65. Thus the meter might remain in place for five years waiting for a new customer before the annual charges on it equaled this cost. If, instead of being disconnected, the service is removed, the meter might remain sealed for a much longer time to balance the higher cost of that alternative. But our records show that if a meter is sealed for two years

* Adapted from paper to Iowa State College Electric Meter Conference.

NEW

G-E PHOTOELECTRIC RELAY for CONTROLLING

STREET LIGHTING ★ FLOODLIGHTING ★ ELECTRIC SIGNS

EASY HANDLING—75 per cent lighter, 85 per cent smaller than previous G-E relays

SIMPLE INSTALLATION—Can be placed in any convenient location. Can be adjusted to turn lights on and off at any practical illumination levels.

LOW MAINTENANCE—Sturdy metal case protects internal parts from injury. Relay withstands traffic jarring.

LONG LIFE—Will operate almost indefinitely. Phototube has three-year life expectancy and will not lose sensitivity.

NOW, for the first time, you can have the advantages of photoelectric lighting control for less than $60.★ A new circuit development has made possible the construction of a new relay at greatly reduced cost. We are passing these savings on to you. The new relay will operate with practically no attention—an occasional checkup of the phototube is all the maintenance required. It can be used to control electric displays and floodlighting, as well as street lighting. For installations where it is desirable to have the phototube mounted separately from the relay box, a special holder can be provided at a small extra price. Many operating companies already have installed these relays and report excellent results. If you would like further information about them, write the nearest G-E sales office or send the coupon to General Electric, Schenectady, N. Y.

★ The new G-E photoelectric relay, CR-7505H9, has a list price of $100. This is subject to a substantial discount. The previous list price of the G-E photoelectric relay was $238.

GENERAL ELECTRIC

General Electric, Dept. 6A-201, Schenectady, N. Y.

Please send me your publication on the CR-7505H9 photoelectric relay, GEA-3092.

Name.....

Company.....

Street Address.....

City..... *State*.....

500-314

the service is very seldom used again in the particular case.

Practically all the sealed meters are restored to use within a year and a half, and that period is therefore taken as the regular term before service is cut and the meter removed. Of course, it sometimes happens that service is again wanted after a year and a half. In such a case, assuming the service was cut at the pole, we estimate the accumulated cost has piled up to $8.72, but of this the fixed charge for sealing of meter is responsible for only $2.07. Considering the infrequency of the case, $6.65 is not a large amount to be spent after a year and a half for service disconnection and reconnection.

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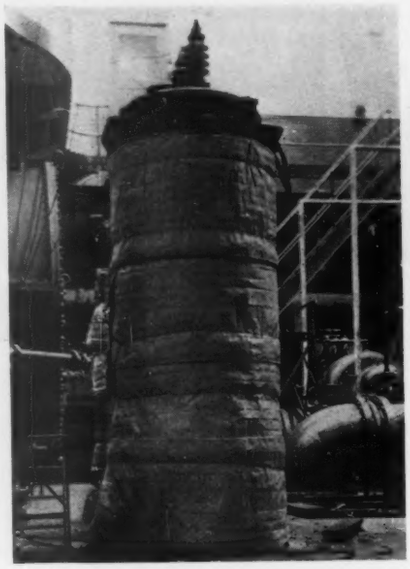

500-kva. substation transformer in heat-insulating quilt

Reclaim Transformer After Submersion

During the hurricane and flood of September 21, 1938, a 500-kva., single-phase transformer at the Harbor View substation of the New Bedford Gas & Edison Light Company was tipped over on its side, the bushings broken by floating débris. Submersion in salt water to a maximum depth of about 10 ft. took place. The voltage rating of the transformer was 13,800/27,600, 600/2,400.

It was reconditioned at the Cannon Street steam plant of the company where it was dried out electrically. A temperature of 120 deg. F. was maintained on the case and to do this 35 amp. at 575 volts was applied to the primary winding with the secondary short-circuited. Heat insulation was provided by three layers of Cabot's quilt, using both 0.5 in. and 1 in. thicknesses.

Drying was kept up for three weeks, with a 24-hour watch to keep a close check on temperature. During this period both top and bottom levels of the oil were tested regularly for moisture, a close watch also being kept on bubbles of moisture coming up through the top oil. The transformer was tested weekly with a megger and also with a Doble set. Final tests of high voltage to ground gave 1,200 megohms, low voltage to ground 1,100 megohms and high voltage to low voltage 2,000 megohms, all at 68 deg. C.

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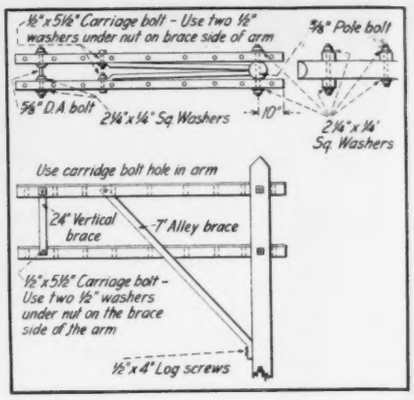
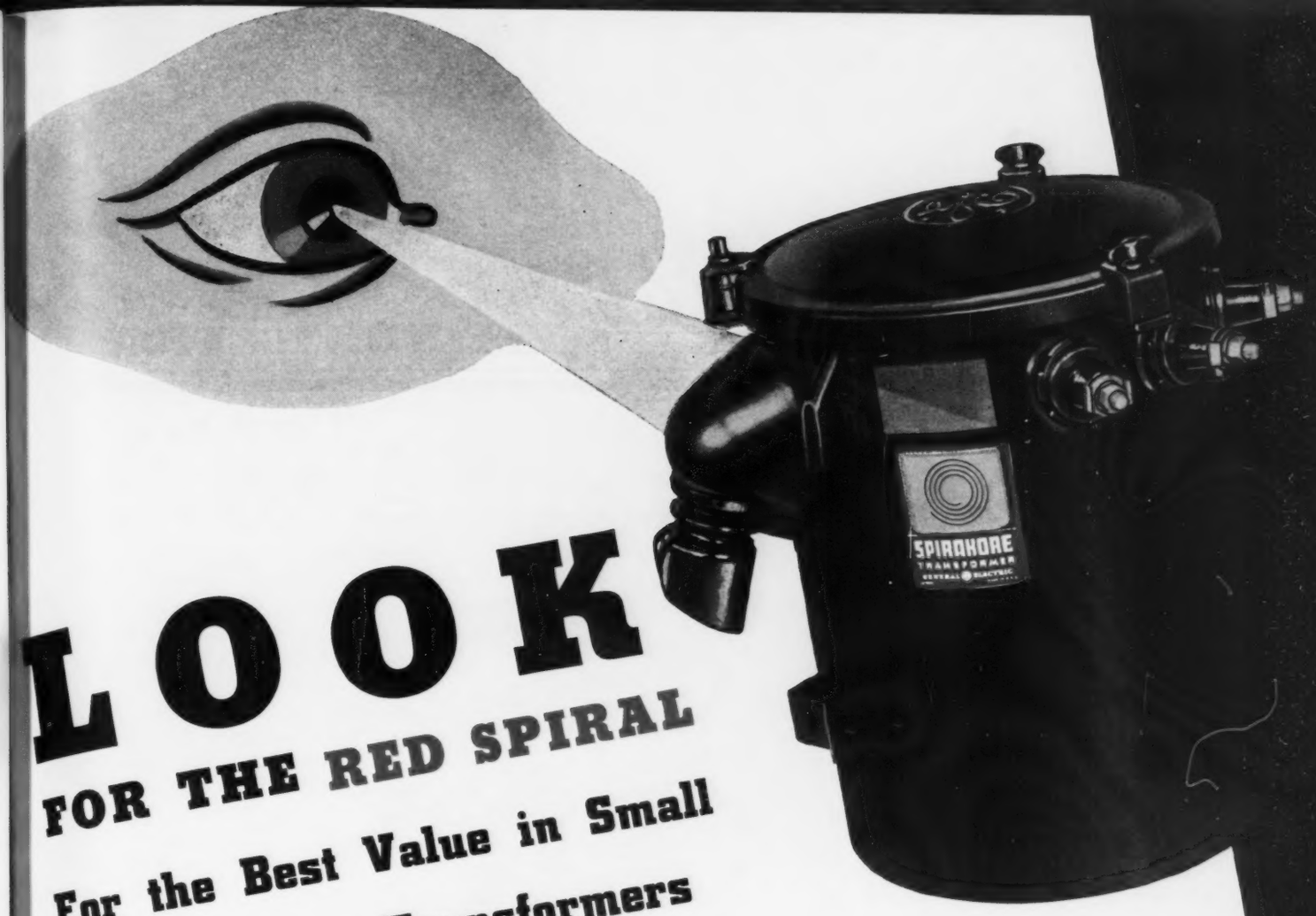
SIDE-ARM CONSTRUCTION


⅝"x5½" Carriage bolt - Use two ½" washers under nut on brace side of arm
⅝" Pole bolt
⅝" D.A bolt
2¼"x¼" Sq. Washers
10"
2¼"x¼" Sq. Washers
Use carriage bolt hole in arm
24" Vertical brace
7' Alley brace
½"x5½" Carriage bolt - Use two ½" washers under nut on the brace side of the arm
½"x4" Log screws

The illustrated type of construction is used by the Stamford Gas & Electric Division of the Connecticut Power Company for side-arm construction in preference to the more common practice of fastening the alley brace to the lower double arm and relying on the stiffness of the vertical brace to support the load on the upper arm. This practice has the disadvantage, however, of reducing the pin space on the lower arm, but its increased strength more than offsets this disadvantage. It is interesting to note that there is a decrease of about 10 per cent in the cost of the new type of side-arm construction over the common method.

THE OBSOLETE YIELDS TO THE METAL-INCLOSED

Less space, more reliability, safer operation followed replacement of obsolete breakers and exposed bus at Norfolk substation of Virginia Electric & Power Company by metal-inclosed 2.3-kv. feeder switching equipment, buses and transformer connections



LOOK

FOR THE RED SPIRAL

For the Best Value in Small Distribution Transformers

SPIRAKORE* transformers are substantially lower in price. Reductions of from 12½ to 18 per cent have been made, in the ratings so far covered by this development, because they are more economical to manufacture.

SPIRAKORE transformers have higher efficiency at heavy loads, lower exciting currents, and better voltage regulation. Price reduction has been achieved not by using cheaper materials or less careful methods but by the use of new and better materials and an even more precise and effective method of manufacture.

SPIRAKORE transformers are easier to handle, install, or relocate because they are lighter in weight. In some ratings the reduction in weight amounts to as much as 40 per cent.

SPIRAKORE transformers are the answer to your search for a better transformer at a lower cost to serve areas of light load density.

G-E SPIRAKORE transformers can be identified by the red spiral on the tank. They are available in 1 1/2- to 3-kva ratings, described in Bulletin GEA-3085. From now on, specify G-E SPIRAKORE transformers. General Electric Co., Schenectady, N. Y.

SPIRAKORE is the General Electric trade name for transformers of the new wound-core construction.

GENERAL ELECTRIC

30

Industrial ELECTRIFICATION

New ideas and practices in industrial electrification as presented by industrial, consulting and power sales engineers

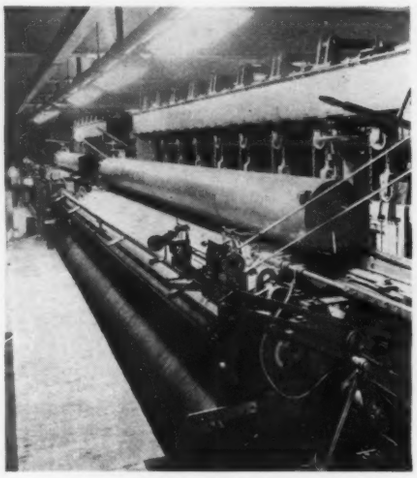
Better Lighting Aids WireMeshProduction

By J. B. WILLIAMS
Plant Manager
Cheney Bigelow Works, Springfield, Mass.

Proper illumination in the manufacture of Fourdrinier wires is a serious problem, particularly from the economic viewpoint. Flaws in the wire occasioned in any one of the many manufacturing operations may very probably shorten the life of the wire—a result expensive for both the paper manufacturer and the wire company. Fourdrinier wire is an endless fine-mesh belt of woven wire, and is the means by which the paper sheet is formed in modern paper-making machines. Each wire is made to order for a particular machine.

Cheney Bigelow Wire Works recently purchased two new foreign looms operating on a somewhat different principle and having a much higher operating speed than those built in our own shop. Since the travel of the high-speed shuttle is more than 20 ft., it is a difficult matter for the wire weaver to spot all breaks or other defects. Avoidance of spoilage in a product that sells for from 55 to 70 cents a sq.ft. is essential. It was necessary, therefore, to provide a higher level of illumination than heretofore used and one which did not give glare from the highly polished wire.

Our problem was adequately solved by the installation of three lighting units over the face of the work on each loom. These units consist of a low-pressure Cooper-Hewitt 275-watt mercury tube mounted in a reflector with four 100-watt tungsten incandescents. The units are located about 4 ft. above the wire cloth and deliver an intensity of 120 ft.-candles on the work, without sensible glare. Every warp and filler wire stands out clearly.



Combination lighting units over Fourdrinier wire looms deliver 120 ft.-candles without glare

80 ft.-candles on table where woven wire mesh is soldered into endless belt relieves eyestrain

Three 300-watt supplementary incandescents in Glassteel reflectors are mounted above each loom at the rear over the warp beam.

Lighting conditions are even more important in soldering the wire together to form an endless belt than in weaving it. The soldered joint must be nearly perfect and each wire end, among the thousands of warp wires, must be firmly fastened. The seam must also be flat and have the proper drainage so as not to cause a mark on the paper.

This delicate task is done at two tables 22 ft. long by 3 ft. 6 in. wide, each being provided with three combination skylight units at right angles to the table and about 4 ft. above. Again a 275-watt mercury-vapor tube and four incandescents are used in each unit. An intensity of 80 ft.-candles is delivered to the soldering table, which suffices. The glare formerly resulting from the use of three 200-watt tungstens with an older type of reflector has been done away with.

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Notes On Using Infra-Red Heat*

Several factors must be kept in mind in applying infra-red light to heating and drying operation in industry. These include heat distribution, temperature control, number of lamps, spacing of the lamps with respect to the subject, nature of the material heated and type of lamp reflector.

With infra-red light the heating ef-

* This summary was prepared from a report of the discussion following a paper presented by G. M. Allen of the Detroit Edison Company before the Great Lakes Power Club. A report of Mr. Allen's paper appeared in this department in the issue of December 31, 1938.

in a Woolworth Store *until we installed* . . . BUSS FUSES !

BUSS Super Lag FUSES

fect per unit of space varies as the square of the distance of the lamp to the subject. However, if the lamp is too close to the surface being treated, uneven heat distribution will result. Temperature control in mass production jobs can best be obtained by controlling the speed of the conveyor carrying the parts past the bank of lights. In stationary work temperature control is obtained by varying the distance of the lamp from the work. The number of banked lights for a given application is best determined by cut and try on a small section and then calculated for the entire project.

Although tests are not complete, it is believed that infra-red light should prove successful in heating the inside of closed metal containers if light rays are directed over the entire outer surface and if the metal is not too thick. It is also believed that infra-red light may be successfully applied to the heating of glass, since it is known that infra-red light will penetrate glass to varying depths depending on the ingredients of the glass.

Reflectors used in the early applications of infra-red light were simply 7-in. or 8-in. auto headlights adapted to a socket. Later installations used 11-in. reflectors. For reflecting surfaces, however, aluminum is not recommended, since it will oxidize rapidly, cutting down efficiency unless treated. The best reflecting surface is gold plate.

The original application of infra-red to industrial processes by this method was made by the Ford Motor Company, which used it for paint drying.

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Construction Data on All-Welded Building

Analysis of labor, material, time and energy consumed in completing Boston's fourth important electrically welded building structure reveals that 13,754 kw.-hr. was used in joining the 2,274 tons of structural steel in the building, an average of 6.05 kw.-hr. per ton.

Other data on the construction of the new George Robert White Building of the Massachusetts General Hospital, here presented in tabular form, were given before a recent joint meeting of the Boston Society of Civil Engineers and the Boston section of the American Welding Society by J. Theodore Whitney, president Whitney Engineering Company.

Eight 20-hp. machines of 300 amp. Capacity were used and welding wire sizes of $\frac{5}{32}$ and $\frac{3}{16}$ in. diameter were selected for electrode service. A total of 5,400 lb. of electrode wire was used, 500 lb. being $\frac{5}{32}$ in. and 4,900 lb. being $\frac{3}{16}$ in.

Power for the welders was supplied by the Boston Edison Company from permanent service to the new building. Welder demand on a fifteen-minute basis for the three months of September, October and November was 47, 61 and 59 kw. respectively.

With electric welding erection was reported to be speedier, the frame stiffer, less scaffolding was needed, field changes were easier.

Electric Welding Data

Massachusetts General Hospital
George Robert White Building

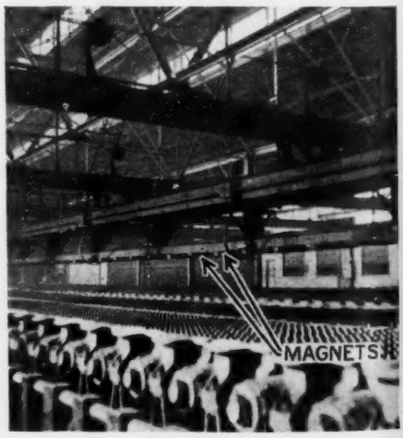
(Welding Started August 16, 1938; Welding Finished November 23, 1938)

Height basement floor to roof (18 levels), feet	206
Total tonnage in building, tons	2,274
Number of inches of welding (all sizes)	115,238
Equivalent 5/16ths weld, inches	129,516
Equivalent 3/8ths weld, inches	89,925
Number of inches of weld (all sizes) per ton	50.68
Number of inches of 5/16ths equivalent per ton	56.95
Number of inches 3/8ths equivalent per ton	39.54
Number of inches of weld (all sizes) done by foreman	3,074
Number of inches (all sizes) done by welders	112,164
Number of hours of welders' time	2,060
Inches per hour of welders' time	54.4
Feet per day welders' time	36.26
Total helpers' time, hours	580
Number of inches per hour of helpers' time	198.7
Number of hours hoisting engineer's time	842
Number of inches of weld per hour of hoisting Eng.'s time	136.86
Number of hours of foreman	592
Number of inches (all sizes) per hour of foreman's time	194.7
Electrode used, pounds total	5,400
Weld, per lb. of electrode wire bought, inches	21.34
Inches of weld per lb. of electrode melted	30.49
Amount of electrode melted, pounds (Assume waste as 30%; 1,620 lb.)	3,780
Pounds of electrode melted per ton of steel	1⅔
Number of kw.-hr. electricity used	13,754
Number of kw.-hr. used per ton of steel	6.05
Number of kw.-hr. used per lb. of electrode melted	3.63
Number of lbs. of electrode melted by 1 kw.-hr.	0.274

JAPANNING OVEN HANDLES 320 UNITS AN HOUR

Latest addition to the japanning room of the Royal Typewriter Company at Hartford, Conn., is this 110-kw. oven that handles 320 typewriter frames an hour. Frames are charged onto a continuously moving belt that carries them into the 400-deg. heating chamber of the oven. Besides the unit shown there are two other similar ovens now in service. About an hour is required to bring the ovens to temperature after shutdown. The japanning room is completely electrified and the spraying room is air conditioned to control temperature and dust.

MULTIPLE UNIT MAGNET TRANSFERS STRIP STEEL



Exceptional in size and design is a multiple-unit Magnet used in the Riverside plant of the Acme Steel Company, Chicago, Ill., to shift lengths of strip steel from one transfer table to another. The magnet, shown, comprises 72 units spaced 3 ft. apart on a steel frame that can be raised, lowered and moved sideways along a craneway, to transfer the steel as desired.

The co-operative efforts of the Electrical Industry with those engaged in designing and producing watthour meters, have solved — and will continue to solve — the problems of measuring and controlling the wide range of loads of present and future electrical appliances.

SPRINGFIELD · ILLINOIS

New ENGINEERING IDEAS

Discoveries, proposals and developments by electrical engineers and scientists in the field, the factory and the laboratory

Vacuum Filling Boosts Dielectric Strength

By P. L. BELLASCHI and F. J. VOGEL
Westinghouse Electric & Manufacturing Company, Sharon, Pa.

Some five years ago considerable study was made of comparative dielectric strengths of transformer insulation and rod gaps in air against steep waves flashing over on the front. The data indicated little or no actual increase in the transformer insulation strength with decreased time of voltage application. Data were obtained on insulation barriers immersed in oil by placing the barrier in the tank and filling the tank with oil. Precautions to remove air similar to those used in transformers were taken.

Practical difficulties of removing air from insulation structures suggested the desirability of filling commercial transformers under vacuum, but until recently no systematic tests have been made to determine exactly the effect of such vacuum filling on dielectric strength. Recent tests on vacuum-filled barriers showed considerable increase in the voltage at which corona commences for either 60 cycles or impulse. The breakdown voltage at extremely short times or on the front of the wave was shown to be greatly increased. Apparently in the earlier tests pores in the insulating material were not completely filled by immersion alone.

Two series of tests were run on insulation oil-filled under vacuum. One series was made on a barrier representative of the lower voltage classes of transformer insulation. Samples consisted of a flat barrier with oil ducts on each side and a dummy coil with relatively light insulation. Results of this series of tests are shown in Fig. 1 at left. Tests were also made with rod gaps in parallel for comparative purposes. The second series of tests, with barriers of higher voltage classes with angles adjacent to the dummy coil, used coils fairly heavily insulated with paper tape. these barriers were also tested with rod gaps in parallel and the results of the tests are shown in Fig. 1 at right.

Similarity between insulation and rod gap characteristics (shown

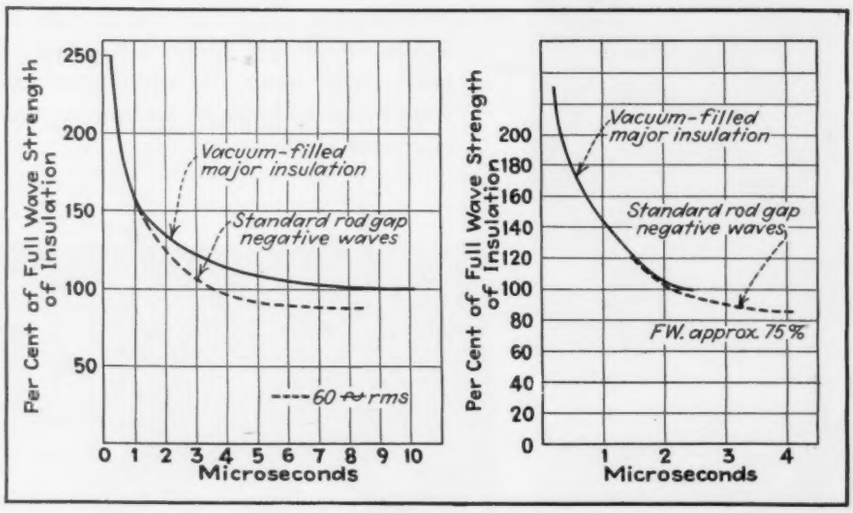


Fig. 1—Volt-time characteristics of (left) high-voltage and (right) low-voltage transformer insulations oil filled under vacuum

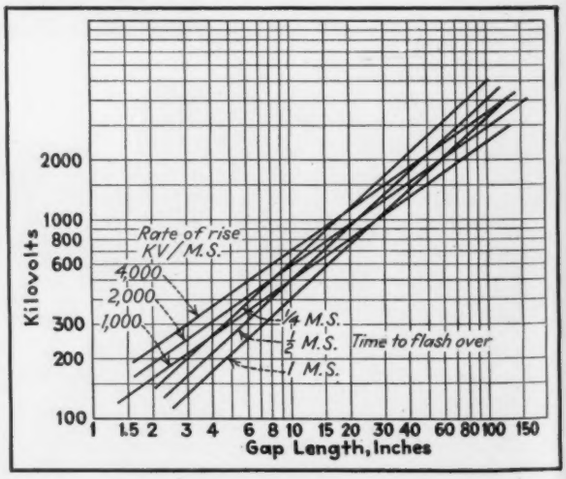
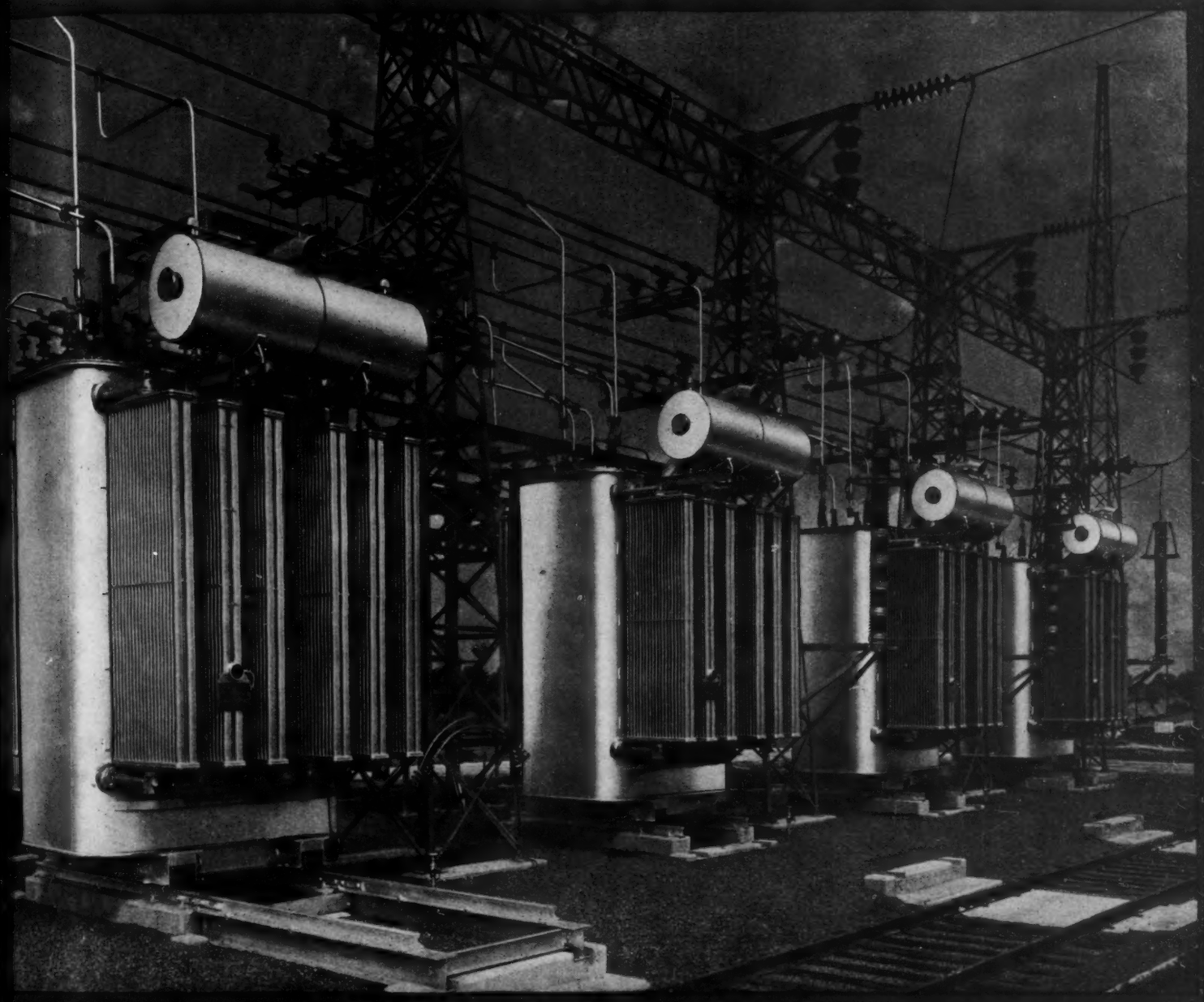


Fig. 2—Sharon data for rod gap flashover on front of wave

It should be noted that at present direct comparisons of volt-time curves obtained in different laboratories cannot be made because of different methods of interpretation of the data, the calibration of the oscillograms, technique, etc. However, making tests with the rod gap directly in parallel with the insulation eliminates these variations.



Four 6667 Kva Moloney Transformers rated 110,000 volts primary, 13,200/26,400/46,000Y volts secondary, and 12,450 volts tertiary.

Dependable Power Transformers such as the Moloney units pictured above . . . are the most economical in the long run.

This dependability is the result of many years of experience in designing and building power transformers of all types.

Operating records of the many Moloney Power Transformers still giving perfect service after years of continuous operation . . . indicate that Moloney Dependability results in maximum economy.

MOLONEY TRANSFORMERS

dotted on Fig. 1) is clearly shown. This similarity indicates that oil-immersed and impregnated insulation, if vacuum-filled, can be protected by rod gaps for any impulse.

However, the test data obtained would apply only to the major insulation. If these data are to apply to transformers the winding must, under all conditions, be equal to or greater in strength than the major insulation. Materials used are important. Materials other than Fullerboard have been applied and used which have much flatter characteristics and which would not have the short time impulse strengths of the barriers described.

Sharon data for rod gaps for negative waves, shown in Fig. 2, when used with curves in Fig. 1 enable one to determine the gap length which would completely protect transformers meeting requirements described above.

Data* for the 138-kv. class indicate that if the major insulation has a strength of 277 kv. at 60 cycles it should develop a strength of about 860 kv. at 2½ microseconds. The one microsecond strength from the right-hand curve in Fig. 1 would be about 144 per cent of 860 or 1,240 kv. and from Fig. 2 a 34½-in. gap should provide protection. Tests on models and commercial transformers have been made confirming the above relationship. It is interesting to note that the gap spacings for steep front protection are not prohibitively short as compared to the corresponding coordinating gaps proposed by the A.I.E.E. transformer subcommittee. Shorter gaps have been applied with little or no operation resulting from switching surges or similar effects.†

* "Factors Influencing the Insulation Coordination of Transformers," F. J. Vogel, A.I.E.E. *Transactions*, Vol. 52, 1933, page 41.

† "Application of Spill Gaps and Selection of Insulation Levels," H. L. Melvin and R. E. Pierce, *Electrical Engineering*, June, 1937, page 689.

•

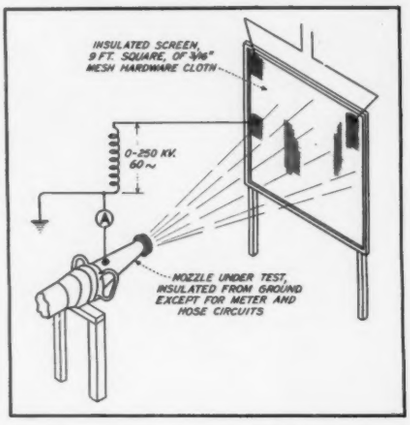
Conductivity Tests on Diffused Fire Stream

Electrical conductivity tests on the fire stream from a new-type nozzle which throws a diffused, finely divided stream of water of a type devised for fighting fires in or around energized electrical equipment revealed no measurable current in the stream when it struck an energized 250,000-volt line 8 ft. away.

Current in Diffused Fire Stream

Nozzle pressure, 60 lb./in.², 30 deg. stream.

Screen Voltage	Range in Feet: 1	2	3	4	6	8	10
	current in milliamperes, r.m.s.						
2,200	0.0						
4,400	1.0						
6,600	1.8						
11,000	4.2						
22,000							
33,000		0.0					
66,000		0.6	1.2	0.0			
88,000		1.9	1.3	0.2	0.0	–	
110,000			1.4	0.7	0.0	–	
132,000			–	–	0.3	–	
250,000						–	1.2


INSULATED SCREEN, 9 FT. SQUARE, OF ¼" MESH HARDWARE CLOTH
0-250 KV. 60 ~
A
NOZZLE UNDER TEST, INSULATED FROM GROUND EXCEPT FOR METER AND HOSE CIRCUITS

Conductivity tests on diffused stream from special nozzle for fighting fires in energized equipment disclose safe operating distances

Tests on the discharge were conducted at Purdue University, where in 1935 a comprehensive study had been made of the safe use of regular hose streams on live circuits. In this earlier work three milliamperes was established as the upper limit of safety for current flowing down a fire stream. This limit was selected not by considering personal injury from the current but rather by the condition that the firemen must not lose control of the nozzle, which if released would become a source of danger. The conclusion then was reached that hose streams should not be allowed to strike high-tension lines of phase voltages over 13,200 volts and that with water of low resistivity it was dangerous to strike circuits above 1,100 volts.

In the more recent Purdue tests the subdivided stream from the nozzle under test was projected, as shown, on an insulated screen maintained at various known 60-cycle potentials to ground. Current flowing down the stream was measured (see table). The accompanying table shows the current flowing in the stream with various voltages on the screen and with the nozzle located at various distances from the screen. Although in the sample case of the tabular test data shown the nozzle pressure was 60 lb. per sq.in., the nozzle operates at pressures as low as 20 lb. per sq.in. Effective range at 50 lb. pressure is 60 ft. The stream from the nozzle as designed has a 30 deg. included angle.

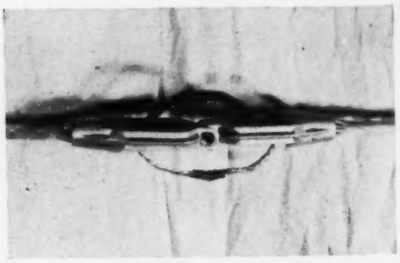
•

Develop Joint-Clamp for SS Cable

By P. R. KNAPP
Toledo Edison Company, Toledo, Ohio

Cable of the SS type—single conductor, rubber insulated and surrounded with a mixed stranding of steel and copper wires which serves as neutral conductor—is used for primaries and frequently as a tree wire. Because of its outside stranding over the softer rubber insulation, this cable presents a troublesome problem in making joints and dead ends. The problem can be solved very neatly by use of the clamp illustrated and which was developed in the Toledo Edison Company. The illustration shows two clamps, bolted together to make a joint. Only one, of course, is used for a dead end.

The clamp consists of two parts, an integral yoke and outer housing and a tapered sleeve which wedges into the housing. First the outer piece is slipped over the end of the cable and the outside stranding is wound off for a sufficient distance. Next the tapered sleeve is slipped on the insulated center conductor and is wedged into the outer housing, thus holding the outside stranding against tension strain. Ends of the stranding and of the inner conductor are thus free for connection as may be required.



For holding SS cable

HOOSIER EFFICIENCY
Our leadership in speedy, sound and economical transmission line erection was founded —and will continue to thrive—on *efficient crews,* directed by able supervisory staffs.
HOOSIER ENGINEERING COMPANY
CHICAGO 46 SOUTH FIFTH ST., COLUMBUS, OHIO NEW YORK
Canadian Hoosier Engineering Company, Ltd., Montreal, Canada
Erectors of Transmission Lines

Building Up THE LOAD

New ideas and practices in selling electrical equipment and service to commercial and domestic customers

Electric Cooking Speeds Service

In handling rush-hour crowds the Spaghetti Palace, Hartford, Conn., solved a difficult problem in volume production without sacrifice of quality by installing a specially designed cooking table with electric heating units in place of a gas-heated outfit. Spaghetti must be cooked in the front window of this establishment, both for publicity and convenience. Atmospheric conditions when using gas were very trying, resulting in headaches for the staff and frequent obscuration of the window pane. Conferring with the power sales department of the Hartford Electric Light Company and with Bauer & Company, contractor-dealer and water heater maker of that city, Armando Darna, proprietor of the restaurant, decided to electrify the spaghetti and sauce kettle units of the establishment. The results have been highly satisfactory, and so far as is known, this is the first application of its kind in commercial cooking service.

Details of equipment

The spaghetti table is equipped with six 4.25-gal. containers 14¼ in. in diameter. The three at the right are, as shown, each equipped with a 2-kw. heating unit and the extreme left-hand container with two 2.5-kw. units. In the basement is a 6-kw. automatic storage water heater of 150-gal. capacity which operates on the company's regular off-peak (11 p.m. to 7 a.m.) night rate of 1 cent per kilowatt-hour. This supplies water at about 185 deg. F. through a ¼-in. insulated copper tube to a swinging faucet above the table from which the two right-hand containers can be filled. The table is of stainless steel construction with insulated walls and chromalox heating units, non-absorbent rock wool being used.

In preparing the spaghetti hot water is drawn into the pots and is quickly brought to a boiling temperature in one of the pots. The pots are so well insulated that boiling will continue for fifteen minutes after switching off the electrical supply. When steam appears under the pot lid the circuit is opened. The spaghetti is drained, cooled with cold water to remove the starch, drained again and placed in one of the containers in the left center of the table. As orders are received, spaghetti is placed in a colander and then in the left-hand container, where it is reheated to boiling temperature. After one more draining it is served piping hot. The complete unit allows for a speed and control in handling orders formerly difficult if not impossible to attain.

High-speed service with sustained quality is assured spaghetti restaurant by electric heating

Steam table features

The steam table at the left maintains the temperatures specified by the proprietor throughout the entire business day. This table, also of Bauer & Company design and make, is drained nightly and filled each morning from the electric storage heater below. There are two insulated compartments with notch-like connection between for circulatory purposes, and half the containers are used for soup and vegetable storage

A lighting unit of remarkable performance and distinguished appearance

Now use CORRECTALITE for "Light Conditioning" commercial interiors. Here are some of its advantages:

1. The control built into CORRECTALITE gives an amazing concentration of "down light" on utility areas. Yet sufficient light is directed upward to give a pleasing ceiling illumination.
2. The light control of CORRECTALITE is completely enclosed. It is insured against dust and dirt or permanent depreciation.
3. CORRECTALITE is especially styled to harmonize with modern architectural interiors of today and tomorrow.
4. CORRECTALITE is made by Holophane—the result of 40 years of experience in controlling light to serve industry and art.

FREE: Send for your data sheets today. Complete information of the mechanical and lighting specifications of CORRECTALITE. Address:

HOLOPHANE
Engineering Service
342 Madison Avenue, New York City

The Holophane Company, Ltd., 385 Yonge St., Toronto, Can.

CORRECTALITE is equipped with ceiling or suspension type fixtures for use with 200 or 300 watt lamps. The removable bottom cup in CORRECTALITE makes relamping easy.

IN-BILT CORRECTALITE is equipped with plaster ring and finishing ring. The complete unit is installed with remarkable ease.

hot and the other half for sauces. Sauces are kept refrigerated at night and the apparatus has sufficient capacity to bring them up to serving temperature in a few moments. In addition to these units the restaurant used air conditioning, a 3-kw. Silex coffee maker, a 2.5-kw. "Toastmaster," electric refrigeration and a 4-kw. electric fry kettle.

•

Utah Power Repeats Mobile Display Plan

When depression budgets made it apparent that small-town retailers could not afford frequent visits to population centers for purposes of educating themselves in regard to developments in electrical equipment the Utah Power & Light Company conducted, in the small towns themselves, demonstrations of such development.

Demonstrations were confined to particular types of equipment and the displays and samples were so selected that they could be packed into a truck, which moved from town to town, carrying both equipment and personnel. One year it was known as a "fix-it" truck and carried a display of lamps and small appliances, together with a crew which repaired and demonstrated these. Another year the truck was devoted to displaying the latest types of restaurant equipment.

This year's exhibit, devised by L. B. Gawan, manager of the company's commercial sales, is devoted to commercial lighting. It includes such equipment as floodlights, model store fronts, structural glass, sodium-vapor lamps.

Moving on schedule, the exhibit is first shown in preview for the benefit of dealers in a given town, a hall being rented for the purpose. Dealers are assured an endeavor will be made to sell their lighting equipment and are invited to augment the exhibit with their own displays.

Programs are arranged for high-school classes, civic and business groups and for formal evening showings at which a trained lecturer dramatizes the story of better light.

Should any visitor show interest in specific equipment, that equipment can be taken to his place of business for demonstration, personnel being available for this purpose. Treatment emphasizes, but is not confined to, commercial lighting. For instance, an industrial prospect can be furnished with a display which will indicate exactly how work in his establishment can be done under 80 ft.-candles of illumination. A residential prospect, on the other hand, can receive the attention of a home service supervisor. Also, one or more of the crew is prepared to meet requests for special programs—perhaps a talk on highway lighting, for example.

Public interest in the arrival of the show is awakened in advance by newspaper and direct-mail publicity.

Traveling exhibit of commercial lighting, set up and operating in one of the many small towns in Utah Power & Light territory

Range, Lights for Pumpkin Hill School

By L. A. BILL
Manager Twin State Gas & Electric Co., St. Johnsbury, Vt.

Is it possible to equip a very modest, small rural school in the green hills of Vermont with lights and an electric range? The St. Johnsbury division of the Twin State Gas & Electric Company says "it is," and this is how it did it.

Our lighting adviser and home service representative, Lillian McGill, learned that the Pumpkin Hill school of Danville, Vt., ¼ mile from our lines, was without electric lights and that all requests made to the School Board had been denied because of the expense of wiring and extra monthly minimum charge of $4.50 for extension of service.

She had been giving talks before several P.T.A. groups on school lighting and had found them very responsive to improved recommendations. In talking over the urgent need of this school with their P.T.A., it was decided they would shoulder the expense of wiring the building and assume one-third of the minimum charge. The school committee agreed to meet the remainder. Thus the lighting was taken care of.

Her next thought was to plan some way to use to advantage the full amount of current they would be paying for under the minimum charge, and she knew an electric range would solve many of their problems of hot lunches and dinners, as well as aid in social activities.

The free range wiring policy would eliminate a portion of the wiring cost and the amount saved on the wiring could be used as a down payment on the range. The P.T.A. saw the advantages as outlined to them, purchased the range and by their various activities raised the money and paid for it within 30 days.

Besides the conveniences of hot lunches and dinners for the school children, the P.T.A. have served suppers to the Kiwanis from the St. Johnsbury, the Danville Chamber of Commerce and others, setting up tables in the school room to accommodate 40. They have earned $175 since putting in the service, besides wiring the schoolhouse and paying for the range, and are now planning to enlarge the kitchen.

Confidence

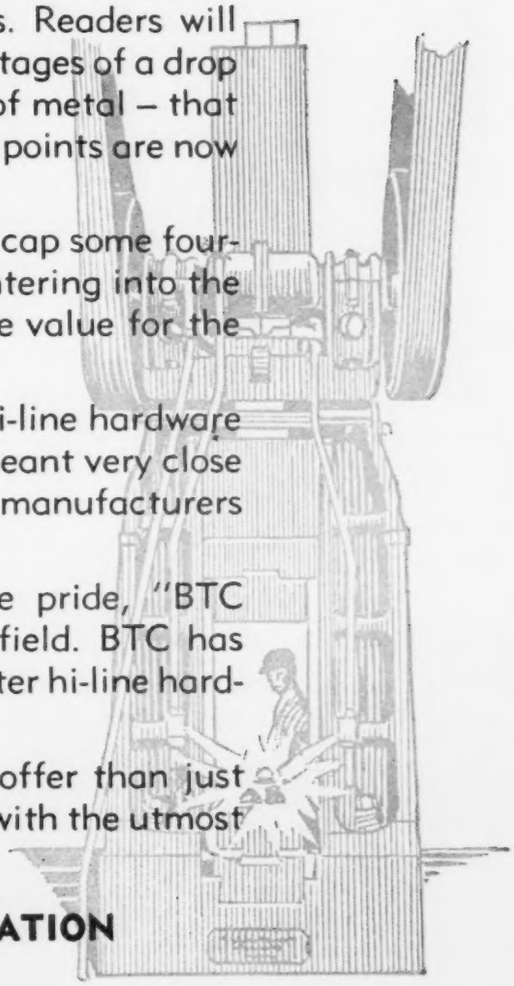
Quite a puddle of water has passed over the dam since BTC inserted its first advertisement in these pages. Readers will recall how we continued to point out the advantages of a drop forging. Strength with lightness – uniformity of metal – that added margin of safety – dependability. Those points are now accepted and proven facts.

But since the conception of the drop forged cap some fourteen years ago, there have been other factors entering into the picture. Factors that we believe have a definite value for the man that writes the specifications.

The development of all this drop forged hi-line hardware that you use and see in the BTC catalog has meant very close contact with utility engineers and insulator manufacturers alike.

We feel that we can say with pardonable pride, "BTC knows and understands the problem of this field. BTC has had a definite hand in the development of better hi-line hardware."

And so we say, we have something more to offer than just hardware. A trade name that can be specified with the utmost confidence.



THE BREWER-TITCHENER CORPORATION
Cortland, New York

Specify BTC Drop Forged Hardware

New EQUIPMENT AVAILABLE

White Print Machines

Three white print machines are announced by this company whose duplicating process is the positive print, dry developing type. One of these, an office-size printer, is designed to duplicate specifications, records, correspondence or other office forms and will handle material up to 9 in. wide. A feature of this machine, which makes use of light transmitted by the new high-pressure capillary-type mercury vapor lamp, is that the copy to be used for duplication need not be transparent. It is driven by a ¼-hp. motor. A second machine, for average print requirements, takes material up to 42 in. in width and has a capacity up to 32 linear inches per minute. It uses the Cooper-Hewitt mercury-vapor tube. The third is an automatic, high-speed unit, taking material up to 42 in. in width and having a speed up to 20 ft. per minute. It uses a specially designed high-pressure mercury-vapor tube, with a rating of 3,700 watts and an efficiency of 50 lumens per watt. This machine, for the first time, provides the feature of automatic separation of print and tracing.

Model "A" automatic high-speed white print machine; built for 220-volt a.c. operation, rated at 7½ kw. per hour for both printer and developer; Models "E" for average print requirements and "D" office-size printer, not shown. **Ozalid Corp.**, New York, N. Y.

•

Fuse Switches

"Trip-O-Link" fuse switches. **James R. Kearney Corp.**, St. Louis, Mo.

This company has recently expanded its line of high-voltage fuse switches to include ratings up through and including 69 kv., the ratings from 23 kv. up being of 75-amp. capacity. Resilient wedge type contacts in these switches grip directly on the fuse link, to make for high conductivity current transfer. Since each fuse link has an integral fibre cartridge, a complete replacement unit is provided with each refusing.

•

Hoist and Crane Motors

Type "CI" hoist and crane motors; 1 to 200 hp. intermittent rated; Type "CS" squirrel-cage hoist motors. **Westinghouse Electric & Mfg. Co.**, East Pittsburgh, Pa.

Developed for intermittent service where frequent starts, stops and reversals are encountered, and particularly for such applications as cranes, hoists, auto lifts, door operators, gate valves and steel-mill auxiliaries, new industrial motors have been announced by this company.

•

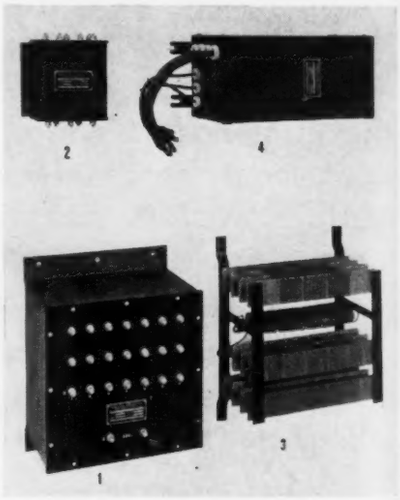
Clamp-Ammeter

Six ranges are combined in this new clamp-ammeter, designed to measure current flow from 1 to 500 amp. through conductors—insulated or non-insulated—up to 2¼ in. in diameter. Case, handle and trigger are molded from Bakelite; clamping jaws are rubber-insulated. Remote measurements may also be made with this device. For this service the instrument is removed from the clamp-ammeter and inserted into a fixed receptacle in the carrying case; an extension cable, plugged into the clamp-ammeter, is attached to the carrying case. Range changer located at thumb position provides for selection of desired range.

Model "633" clamp-ammeter; uses Weston Model "301" instrument; may be used on 660 volts a.c., on all commercial frequencies, with an accuracy of 3 per cent or better between 50 and 70 cycles. **Weston Electrical Instrument Corp.**, Newark, N. J.

Meter Testing Equipment

Offered for use by meter departments in remodeling their present testing equipment new "uniload" sets are intended to help provide a simple and compact testing equipment in which a single switching operation will furnish the desired current or potential for the equipment under test. Sets consists of multi-range transformers and loading equipment designed for switchboard mounting. They are furnished in forms suitable for gang-type, single-position and rotating standard test tables, and are available in various capacities. It is said that the rotating standard—which is calibrated and operated at the full-load point—cannot be subjected to accidental overloads by any manipulation of the switches.



"Uniload" set; showing parts for a six-position, gang-type test table; set supplies current ranges from 0.5 to 25 amp., potential ranges of 110 and 220 volts. **Electrical Facilities, Inc.**, Oakland, Calif.

•

Water Gauge Illuminator

Neon illuminator; regularly furnished for 110-120 volts, 60 cycles; also available for 25 cycles and for 220 volts. **Wright-Austin Co.**, Detroit, Mich.

The visibility properties of neon are utilized in this gauge glass illuminator to make the water—or liquid—level readable at a distance of 150 ft. or more, day or night, according to the makers. The illuminator is placed behind the gauge glass; with it attached, the entire length of the gauge glass is illuminated, but the liquid-filled portion appears as a broad red band the entire width of the glass, while only a narrow strip of red appears in the steam space above. An aluminum enclosing case

The COMPLETE Line

Every kind of conductor fitting—for tube, bar, cable, or wire. Every size. More than 6,200 items.

Including many *Improved Fittings* originated by Penn-Union to give you quicker and easier connections, that are *Permanent* and *Dependable.*

Clamp Type Terminals for every size and type conductor. All types—for any application.

Universal Clamp, that takes a wide range of wire sizes.

Most Popular Type of connector, with innumerable uses — the all-around favorite of practically every user of current.

Set-screw connectors for solid and stranded cable.

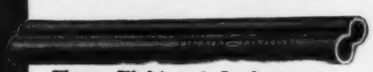
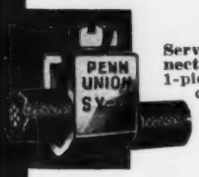


Figure Eight and **Oval** copper tube sleeves, also split tinned sleeves, etc.



Service Entrance Connectors, with heavy 1-piece hard drawn copper body.

Fuse Clips, Ferrule and Knife - Blade types, spring tempered bronze.

Every Penn-Union Connector is Dependable. Preferred by the leading utility companies and "industrials."

Sold by leading jobbers

PENN-UNION ELECTRIC CORPORATION

ERIE, PA.

PENN-UNION Conductor Fittings

for the illuminator protects it against damage caused by escaping hot water and steam or bursting gauge glasses.

•

Synchronous Motor Control

For controlling the application and removal of d.c. field excitation for industrial synchronous motors, a new relay is of the "polarized field-frequency" type. The polarized action of the relay is said to make it selective to apply field excitation at the most favorable angle between the stator and rotor poles of the motor to pull it promptly into synchronism without pole slippage. Relay also uses frequency of the current induced in the field winding during starting to apply excitation at the right motor speed for synchronizing. Should a momentary voltage dip or overload pull the motor out of step, the relay removes excitation automatically.

Polarized field-frequency relay. **Electric Machinery Mfg. Co.,** Minneapolis, Minn.

•

Bus Support

Interlocking teeth have been provided on the neck of this improved bus support, permitting tubular bus to be set at an angle to the steel structure. Finer adjustments than the teeth will give may be made by means of the slightly ovalized bolt holes in the base. Tube clamping members are arranged so that either a tight fit or a slide fit may be obtained, according to requirements.

Type "UH" bus support. **Burndy Engineering Co., Inc.,** New York, N. Y.

•

Street Lighting

Recent developments of this company for street and highway lighting applications include: (1) Photo-electric relay for street lighting control, which embodies principles of former relays but is about one-eighth the size of former equipment

"MEGGER"

*

Ask Your Insurance Engineer

Today a "Megger" Insulation Testing Instrument is as necessary to the insurance engineer who covers electrical risks, as a clinical thermometer is to a physician. It tells him "what is going on" inside of windings, coils, conduits, cables—places where one cannot see or feel.

During the past 20 years insurance companies have made *hundreds of thousands* of "Megger" tests, in order to forestall failure in electrical equipment. They not only depend on "Megger" tests themselves, but they are sympathetic to the use of "Megger" instruments by their insured to increase operating efficiency.

"Megger" testing is good practice for any one who is responsible for the operation and maintenance of electrical equipment.

Write for our recently issued Bulletin 1580-W, entitled *"Megger" Insurance.*

JAMES G. BIDDLE CO.

ELECTRICAL INSTRUMENTS

1211-13 ARCH STREET PHILADELPHIA, PA.

* Photo by Courtesy of The Hartford Steam Boiler Inspection & Insurance Co.

Across the Nation

FRIG

Thousands Acclaim FRIGIDAIRE FOR 1939!

● From city and town, from every corner of the nation, Frigidaire selling men...thousands of them...are meeting in convention to greet the sensational new Frigidaire for 1939. Up and down the country Frigidaire's "flying" convention crews are revealing to anxiously waiting audiences the secret of Frigidaire's confidence for 1939.

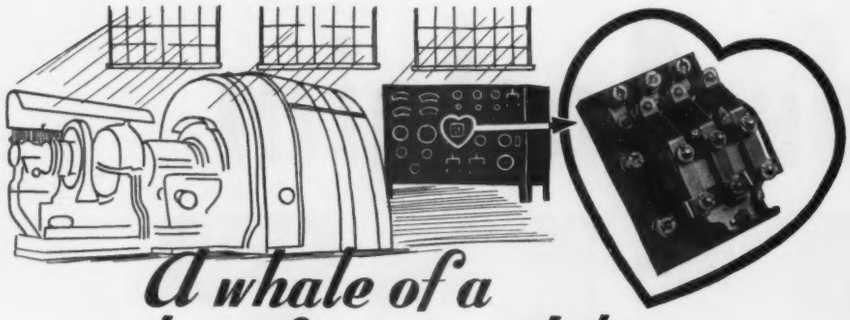
In cities from coast to coast, Frigidaire is making an announcement of major importance that bears out Frigidaire's adherence to its basic obligation: that it must not fail to contribute in some real manner to the advancement of the industry as well as to the advancement of the living standards of the public. In the past Frigidaire has fostered many such fundamental improvements. Nevertheless, important as these contributions have been, Frigidaire's achievement for 1939 surpasses anything that Frigidaire has ever done before.

In unveiling to dealers everywhere a startling new line of 1939 products – new in fundamental conception – new in design – new in price structure – Frigidaire reaffirms its willingness to shoulder the responsibilities entrusted by leadership. And, coming at a time when leadership is so vitally important, Frigidaire is now proving conclusively that this trust has not been misplaced.

Out of the enthusiasm and acclaim of thousands of men, who this month are viewing the new 1939 line of Frigidaire refrigerators and electric ranges for the first time, has come the firm conviction that again Frigidaire is writing a new chapter in electrical appliance history.

FRIGIDAIRE DIVISION, GENERAL MOTORS SALES CORPORATION, DAYTON, OHIO
ELECTRIC REFRIGERATORS · ELECTRIC RANGES · ELECTRIC WATER HEATERS

IN CONVENTIONS FROM COAST TO COAST THOUSANDS CHEER FRIGIDAIRE!



A whale of a lot of responsibility—

is often placed on an otherwise insignificant little Relay. To assure you an *instrument* that is as perfect as can be made—Struthers Dunn, Inc., has specialized in making the highest grade of electrical controls—relays, timers, etc., that are tailor made for the specific job by intelligent artisans of the profession—men whose product is their hobby and pride.

The next time you are in need of an

electric control

write our Engineers for their cooperation. You will find it pays.

Scientific Design

STRUTHERS DUNN, INC.
142 N. JUNIPER STREET
PHILADELPHIA, PA.

Severe Test and Inspection

DUNCO *Electrical Control* **DEVICES**

More than an accessory—an improver of prestige, dependability and performance

Cut the Concrete Manhole Construction Costs with PENOTE SECTIONAL STEEL MANHOLE FORMS

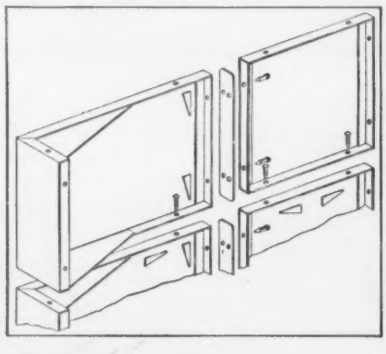
Penote Forms for OCTAGON MANHOLE

Your manholes, built with Penote Sectional Steel Forms, assure greatest flexibility, cost least and take less time to build. Manufactured from husky steel reinforced with "L" angles, Penote Forms are practically indestructible. With one set of forms you can build innumerable manholes—no skilled labor is required—any laborer with an ordinary hammer can quickly and easily install and remove them—they permit pouring complete manhole in one operation and can be used advantageously in loose and fluid soil. All forms are interchangeable. So many sizes are available that we cannot list them here, send us a list of your manhole size requirements and we will tell you what investment is required. Write today.

PENOTE CONCRETE INSERTS and BOLTS for CABLE RACKS . . .

are illustrated below. These semi-steel, sherardized inserts and regular U. S. S. standard cadium plated bolts for racking cable are unsurpassed. They offer many advantages and are low in cost. Write for prices.

ASSEMBLY DETAIL



THE CLEVELAND TRENCHER COMPANY

20100 St. Clair Ave. **Cleveland, Ohio**

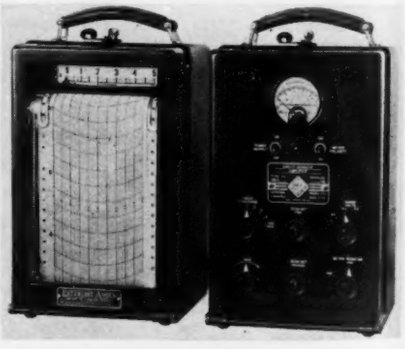
and less than one-third the weight; (2) new luminaire for highway lighting, featuring die-cast aluminum hood, fluted reflector and new refractor, for lightness, strength, better light distribution and utilization; (3) an enclosed-type sodium luminaire, for use especially in tunnels, either suspended from the ceiling or recessed into the wall or ceiling. Sodium lamp is mounted horizontally, with luminaire shielding it from direct vision.

Showing contrast between new and former photo-electric relays for street lighting; highway luminaire and tunnel sodium luminaire not shown. **General Electric Co.**, Schenectady, N. Y.

•

D.C. Amplifier

Designed mainly for industrial use with graphic recorders, this new d.c. amplifier is also suggested for such laboratory uses as amplifying the small d.c. voltages obtained from photo-electric cells, resistance thermometers, sound-level meters and similar instruments. It can be used as a recording d.c. milliammeter or milli-voltmeter in conjunction with the graphic recorder. Amplifier operates from a.c. line and is said to be essentially unaffected by changes in line voltage or ambient temperature.

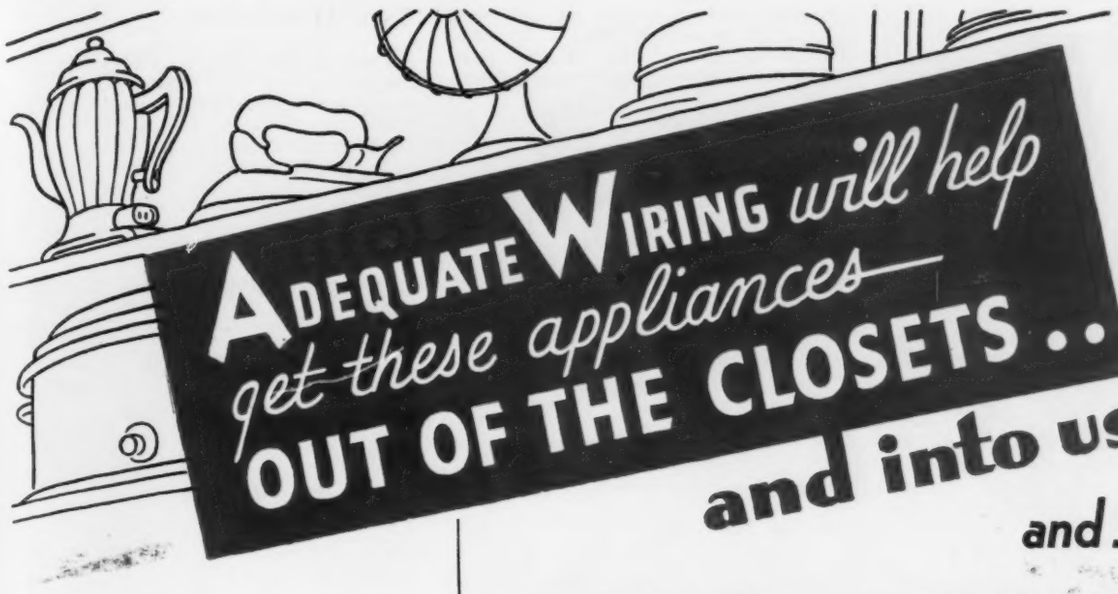


Type "715-A" d.c. amplifier with Esterline-Angus graphic recorder; four ranges, giving output of 5 milliamp. into a 5,000-ohm load for input voltages of 0.1, 0.2, 0.5 and 1.0 volt; maximum gain, expressed as trans-conductance, 50,000 microhms. **General Radio Co.**, Cambridge, Mass.

•

Circuit Breaker Recloser

For operating oil circuit breakers, this company has announced an improved mechanism. It features a new motor-driven timing relay arranged to give a series of reclosures within a total time of three minutes and then to lockout if the breaker has re-opened after the last reclosure. Motor used is a ⅓-hp. repulsion type, 110-220 volts a.c., with 5-amp, inrush and



ADEQUATE WIRING will help get these appliances OUT OF THE CLOSETS . . . and into use!

If . . .

USERS let their appliances gather dust in closets because inadequate wiring prevents getting satisfactory service from them . . .

DEALERS can't readily sell more appliances, and . . .

CONTRACTORS get few calls to install new wiring since users don't make full use of present circuits, and . . .

CENTRAL STATIONS lose revenue and find resistance to building up the more profitable domestic load . . .

Then Everybody in the Industry Loses Profits

WHAT IS THE FUSTAT?

It is a fuse to which a thermal cutout is added.

It protects like a fuse against short circuits — even high resistance shorts such as occur in flexible cords.

It protects against permanent overloads, even when as light as 25%.

Yet it will not blow on motor starting currents of washing machines or other appliances.

Retails at 7½c

It has a base that guards against anyone robbing the circuit of protection.

It fits Edison base fuseholders through the use of an inexpensive adapter.

and . . .

HERE'S HOW the FUSTAT HELPS GET *Adequate Wiring*

It shows need for new circuits

Permanent overloading is positively prevented. Once the correct size Fustat has been installed it cannot be replaced with a larger size and tampering it in any other way is virtually impossible. If additional circuits are needed the user cannot side-step the issue at the sacrifice of safety.

It reduces low voltage complaints

The user cannot load the circuit beyond the proper capacity of the copper. This prevents a voltage drop that is so frequently the cause of complaints about toasters, percolators and other appliances not operating efficiently.

It permits adding more appliances to present circuits

A circuit can be loaded to approved capacity without needless blows and without sacrifice of safety. The long time-lag of the Fustat keeps it from blowing on motor starting currents or other harmless overloads.

It builds user confidence in doing things electrically

When users can add new appliances without being annoyed by needless blows . . . when their appliances operate properly because low voltage cannot be caused by overloading . . . when users get real protection against dangerous cord shorts, such as only a proper size fuse can give . . . when users begin to think of the protective device as a desirable safeguard instead of a nuisance . . . then they will become more thoroughly convinced that the electrical way is the right way to do things . . .

—and right here is where the Fustat comes in to help get old appliances out of the closets onto the line — and to assist the whole industry build towards bigger and better times.

It's just good business to sell, install and use Fustats

The FUSTAT

For full information write to any of these firms

BUSSMANN MFG. CO., University at Jefferson, St. Louis, Mo.
JEFFERSON ELEC. CO., Bellwood, Ill.
KIRKMAN ENGINEERING CORP., 121 Sixth Ave., New York City
NATIONAL ELECTRIC PRODUCTS CORP., Fulton Bldg., Pittsburgh, Pa.
UNION INSULATING CO., 27 Park Place, New York City

Retails at 7½c in 15 to 30 amp. sizes

A GRIP FOR ALL NEEDS

No. 1628-5 B.
"Chicago" Grip.
Maximum opening .563.
Minimum opening .115.
Safe Load, 8,000 lbs.

Here's the new "Chicago" Grip capable of handling messenger or guy strand from 3/16 in. diameter up to 1/2 in. diameter. A genuine all purpose grip that can also be used satisfactorily on bare conductors, solid or stranded, from No. 6 to No. 4/0 seven strand copper and A.C.-S.R. up to No. 3/0. A grip that even satisfactorily handles the new three-strand "copperweld" conductor. The bronze-lined jaws prevent slippage. This new grip will afford a sure hold under all conditions, with loads up to 8,000 lbs.

DISTRIBUTED THROUGH JOBBERS

Foreign Distributor: International Standard Electric Corp., New York

---

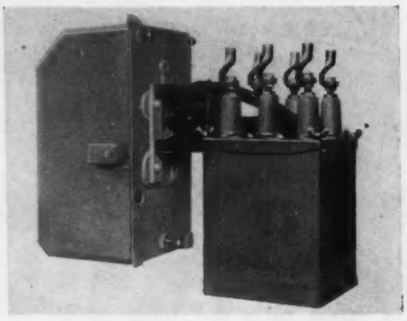
The four pamphlets listed below will be sent without charge to anyone interested. Check the ones you want:

- ☐ **Safety for the Pole Climber.**
- ☐ **Specifications on Linemen's Belts and Safety Straps.**
- ☐ **The Safety Factor on Linemen's Leather Goods.**
- ☐ **Pocket Tool Guide.**

Mathias KLEIN & Sons
Established 1857 — Chicago, Ill. U.S.A.

3200 BELMONT AVENUE

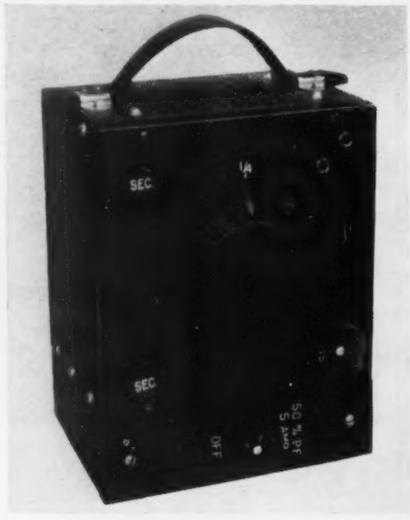
3½-amp. running current on 110 volts. Spring of recloser is said to be strong enough to operate one of the heavy-amperage three-pole station-type breakers.



Type "RPT" reclosing mechanism for indoor use; type "RPTO" for outdoor service, not shown. **Southern States Equipment Co.,** Birmingham, Ala.

Meter Testing

This phantom load for meter testing is equipped with an extra switch position for obtaining a 50 per cent power factor



Type "FDI" phantom load. **States Co.,** Hartford, Conn.

check on 5-amp. meters and a "Lite-A-Dial" rotary switch which throws a beam of light across the desired current step.

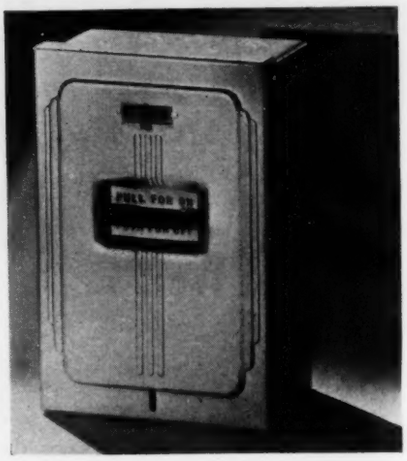
Conduit Fittings

To its line of heavy-duty industrial electrical equipment, this company adds new standard conduit fittings, which include all standard threaded types. Large wiring space is said to be provided and the rounded edges of the covers guard against chafing of wires. Square corners are provided to take standard switch and receptacle plates.

Rectangular "Pyleta," "FS and FD" series "Pylets," "Vaportight" lighting fixtures. **The Pyle-National Co.,** Chicago, Ill.

Type D Switches

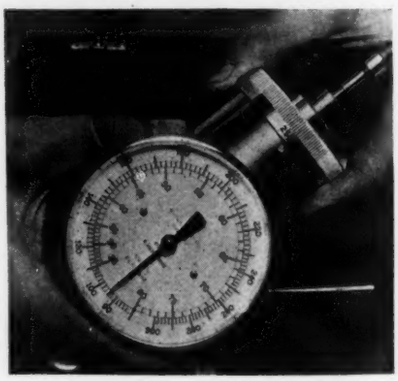
Front-operated type D enclosed switches that are pulled "on" and pushed "off" are a new development of this company. Rated at 30 amp., the complete line consists of devices for 2- and 3-wire solid neutral service 2-pole, 250-volt switches and includes a water heater switch with a grounded neutral and dead-front construction. Switches are offered with or without dead-front plates.



"D Puller" inclosed switch, illustrative of new line. **Cutler-Hammer, Inc.,** Milwaukee, Wis.

Hand Tachometer

Designed especially for plants that need to measure speed over a wide range, this new hand tachometer is said to provide for measuring from 30 to 40,000 r.p.m. in only three range changes. Pointer makes two turns around the dial giving readings on two sets of numerals, one for the inside scale gradations and the other for the outside.



"S&S" hand tachometer; contains eight jewels· two models offered, one for 30 to 40,000 r.p.m., the other for 25 to 30,000 r.p.m. **George Scherr Co.,** 128 Lafayette St., New York, N. Y.

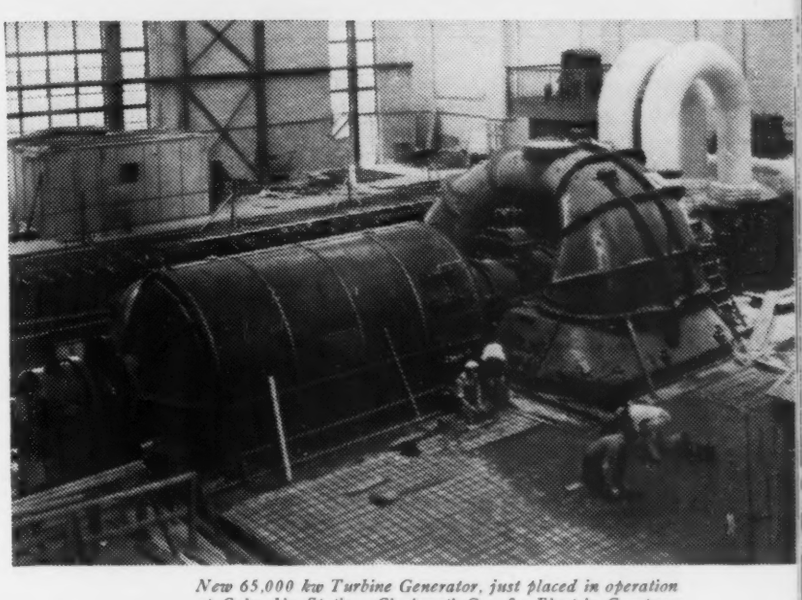
Safety Equipment

Combination "Skullgard" - welding shield; in standard head sizes from 6 to 8; equipped with standard 2 x 4¼-in. shade, 10 welding lens and cover lens. **Mine Safety Appliances Co.,** Pittsburgh, Pa.

Welding safety plus head protection is provided in a new unit which combines the standard cap-type "Skullgard" with a one-piece welding shield. The shield pivots to up or down positions and the "Skullgard" may be removed from the shield and worn separately.

MORE POWER...

Addition of New Turbine Generators to Columbia System's Principal Power Plants Gives Tangible Evidence of Confidence in Continued Growth

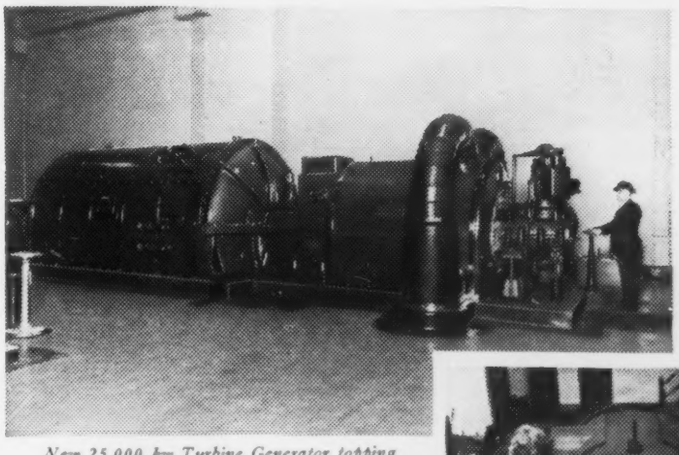


New 65,000 kw Turbine Generator, just placed in operation at Columbia Station, Cincinnati Gas & Electric Company

MORE POWER — for greater production, distribution, comfort, convenience . . . MORE POWER — for factories, stores, office buildings, homes . . . MORE POWER—to stimulate among consumers an increasing use of the potent, energizing force which is ELECTRICITY.

Thus, briefly, are summarized the objectives of Columbia System in adding, during 1938, to the generating capacity of its principal power plants.

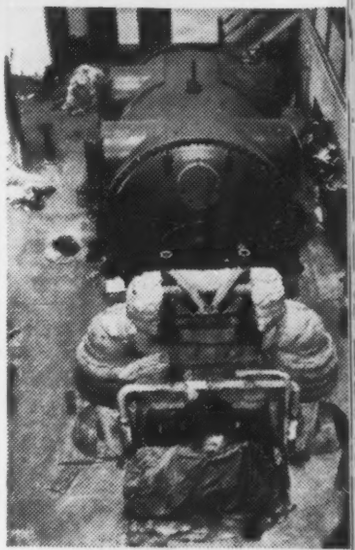
Three new Turbine Generators have been installed to raise the total capacity from 381,750 kw to 506,750 kw—an increase of 125,000 kw, or 32 per cent.



New 25,000 kw Turbine Generator topping unit, now operating at Millers Ford Station, Dayton Power & Light Company

In design and construction, these generating units incorporate the most advanced turbine engineering principles. Capital required for their installation, together with auxiliary equipment, involved an expenditure exceeding $14,000,000—representing an investment in greater electric production facilities towards improved public service.

An expansion program of this kind reflects the forward-looking policy of Columbia System in dealing with varied industrial, commercial and domestic needs of customers for gas and electricity throughout its service territory.



New 35,000 kw Turbine Generator topping unit, nearing completion at West End Station, Cincinnati Gas & Electric Company

COLUMBIA SYSTEM

COLUMBIA GAS & ELECTRIC CORPORATION

News ABOUT PEOPLE

G. C. Kiley Made President Oklahoma Utilities Group

Glenn C. Kiley, western division manager of the Oklahoma Gas & Electric Co., Oklahoma City, has been elected president of the Oklahoma Utilities Association for the year 1939.

Other officers elected include: First

Blank & Stoller

vice-president, Frank B. Long, vice-president Oklahoma Natural Gas Co., Tulsa, Okla.; second vice-president, R. W. McClure, president Oklahoma Power & Water Co., Sand Springs, Okla.; treasurer, W. R. Emerson, vice-president and treasurer Oklahoma Gas & Electric Co., Oklahoma City, Okla.; secretary, Kate A. Niblack.

•

▶OWEN D. YOUNG has been reappointed by the board of governors of the Federal Reserve System as chairman and Federal Reserve agent of the Federal Reserve Bank of New York.

▶WILLIAM G. SMITH, of the James R. Kearney Corp., has been elected to the presidency of the Purchasing Agents' Association of St. Louis.

▶WILBUR DENT of Pontotoc, Miss., has been appointed superintendent of the Sheffield, Ala., power and water departments, to succeed H. M. MEEKS, resigned. Mr. Meeks leaves Sheffield to take a similar position at Jackson, Tenn. Mr. Dent has been in charge of a county co-operative system at Pontotoc for several years. He has many years' experience in power system management.

•

New York Power & Light Makes Operating Changes

David J. Brown has been appointed general superintendent of the electrical department of the New York Power & Light Corp., it was announced by W. J. Gilson, vice-president of the company.

Mr. Brown succeeds Clark A. Terry, who has been transferred to the Central New York Power Corp. at Syracuse, where he will be manager of power supply for the central division of the Niagara Hudson Power System.

S. O. Schamberger has been appointed chief engineer of the New York Power & Light Corp. Mr. Schamberger was formerly hydraulic engineer of the company and has more recently been in charge of the company's generating plants. Following graduation from Union College in 1919 he joined the General Electric Co. and later became identified with the former Adirondack Power & Light Corp. as assistant to the hydraulic engineer.

Mr. Brown has been connected with New York Power & Light and its predecessor companies since 1922, joining the organization as assistant to the superintendent of the general construction department. He was appointed superintendent of construction in 1929. In that capacity he supervised some major construction projects. In 1933 he entered the operating department and the following year was appointed general superintendent of distribution.

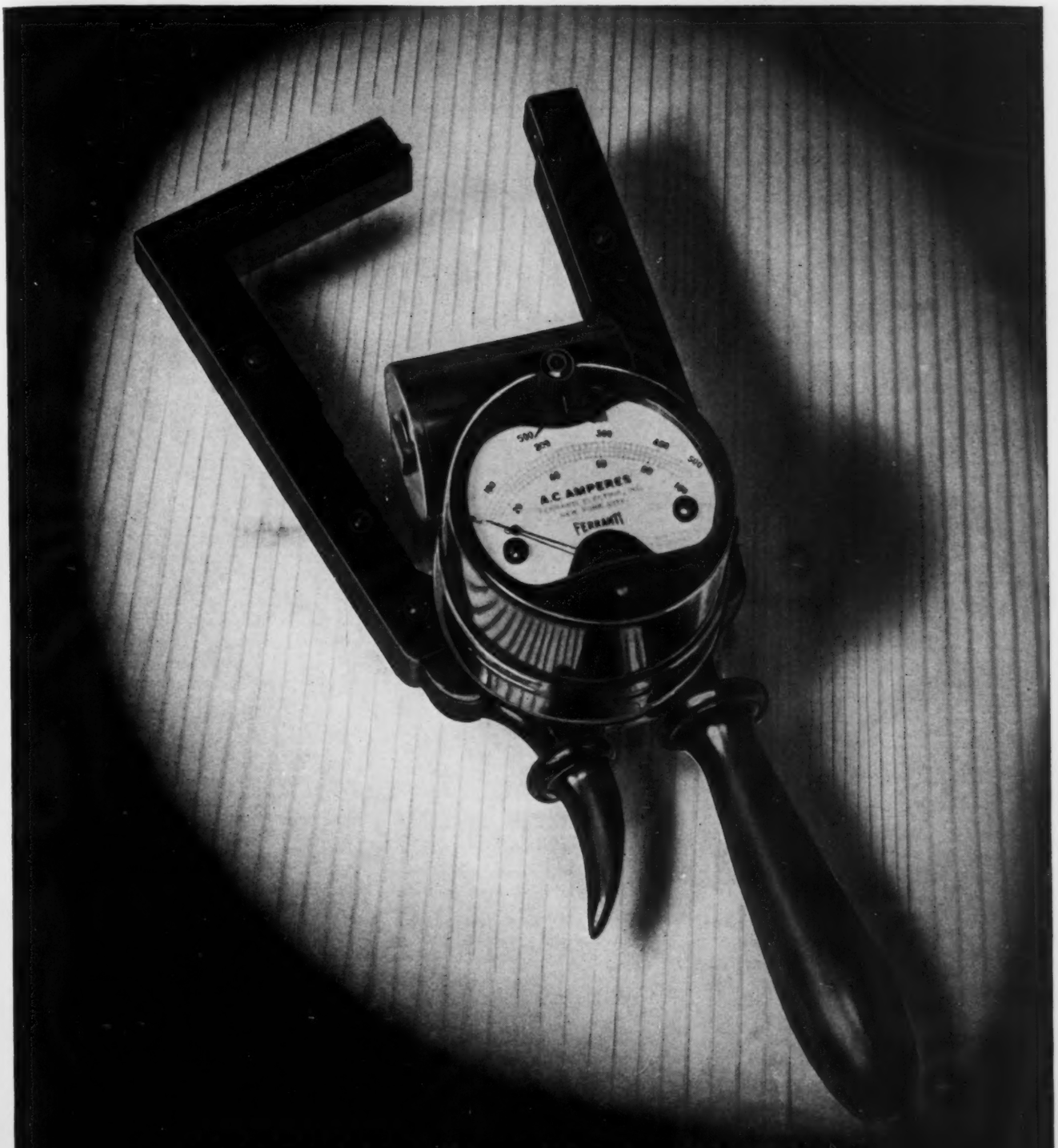
These organization changes, Mr. Gilson said, will enable Gardner C.

D. J. Brown

S. O. Schamberger

C. A. Terry

*New and Improved
CLIP-ON AMMETER



IMMEDIATE DELIVERY FROM STOCK

FERRANTI ELECTRIC, INC. 30 ROCKEFELLER PLAZA NEW YORK, N. Y.

Ferranti Electric, Ltd., Toronto, Canada • Ferranti, Ltd., Hollinwood, England

Highway

LOWERS COSTS

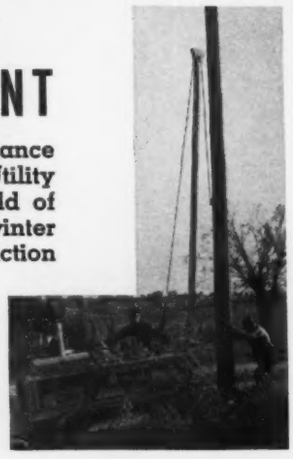
INCREASES SAFETY FOR WORKMEN

INSURES SPEED FOR EMERGENCIES

Mechanized

CONSTRUCTION AND MAINTENANCE EQUIPMENT

Highway Power Line Construction and Maintenance Equipment is specifically designed for Utility Service. Highway designs come from the field of actual experience. Don't be caught short this winter —equip now with modern Highway Construction and Maintenance Tools.



HIGHWAY EARTH BORING MACHINES

Reduce the time element in every operation and lighten the amount of manual labor. Dig through frozen ground—at different angles—and hard-to-get-at places. Restore storm-wrecked lines to permanent service with less than half the usual delay. Many types and sizes available for mounting on truck or tractor.

HIGHWAY WINCHES

Easier to use . . . smooth operation under heavy duty . . . save costs in time, labor, maintenance . . . there's a type for every need — even light enough for use on 1½- and 2-ton trucks.

HIGHWAY DERRICKS

In sizes and capacities for any height and weight of pole. Safety and dependability under all operating conditions. Easily, quickly assembled and disassembled.

WRITE FOR CATALOG

HIGHWAY POLE and CABLE REEL TRAILERS

We make a wide line of pole trailer and combination pole and cable reel trailers to economically meet every requirement. See catalog.

HIGHWAY ACCESSORIES

Drawbars, Towing Hooks, Automotive Pintle Hooks, Pay Out Reels, Collapsible Power Reels —see catalog for complete descriptions.

HIGHWAY TRAILER CO.
EDGERTON WISCONSIN

George, formerly chief engineer, to be relieved from the detailed operation of the engineering department so that his full time and attention can be devoted to important engineering research, for which his long experience in the utility field eminently qualifies him.

•

▶F. H. DOREMUS has been appointed manager of the General Electric transportation department for the Rocky Mountain district. He has assumed these new duties in addition to those as manager of the industrial department of that district. Mr. Doremus has been affiliated with the General Electric Company continuously since 1922, when he entered the student test course at the Schenectady works. He remained at the main works of the company in the capacity of an industrial engineer until 1925, when he was transferred to the industrial department of the Denver office. His appointment as manager for the Rocky Mountain district was announced last August. Mr. Doremus is a graduate of the University of Nebraska.

▶S. F. MYERS, formerly sales manager of the air conditioning department of the Westinghouse Electric & Manufacturing Co., has been appointed assistant manager of the newly formed air conditioning department in Chicago. The department was created to centralize the distribution of the company's air conditioning equipment into two sections, one in the East, located in East Springfield, Mass., where the general headquarters will be located, as well as engineering and manufacturing, and another in the Midwest, located in Chicago.

▶CLARENCE L. LAW of Pelham, N. Y., has been elected a director of the Westchester Lighting Co. and the Yonkers Electric Light & Power Co. Mr. Law will continue as executive assistant to the vice-chairman of the board of directors of Consolidated Edison. As a director of the affiliated companies he succeeds Lewis Gawtry, resigned.

▶EDWIN D. MURRAY, recently with the Federal Power Commission at Denver, has joined the engineering staff of Chase Brass & Copper Co. and will be located at the San Francisco office. Early in his career Mr. Murray was connected with the Great Western Power Co. and Pacific Gas & Electric Co. on construction projects. Subsequently he became identified with the operating department of Southern California Edison Co. as distribution engineer, and later district manager of the Coast Counties Gas & Electric Co. at Hollister, Calif. In 1927 Mr. Murray became a member of the staff of the California Railroad Commission and was variously occupied on utility en-

FOR OVERLOADS

Borrow the "Burro" Idea

The prospector picks on the burro to carry his mountainous pack because the little fellows can haul a load that would stump an elephant. They qualify for the job because they provide *greater carrying capacity* along with the ability to *keep going without breaking down* . . . two qualities that you'll always find in Rockbestos wires, cables and cords.

When you run new circuits or rewire old ones that have been laboring under overloads, remember the burro and use Rockbestos for its greater carrying capacity. Its asbestos insulation withstands the conductor heat developed by overloads because it does not dry out under heat. It eliminates fire-hazard because it won't burn. And it's often more economical than the so-called cheaper wires because its greater carrying capacity permits the use of smaller wire and saves conduit replacement.

If you have an overload condition that is becoming a problem or want to guard against such a condition, let us help you. Rockbestos wires, cables and cords, made to meet severe conditions, are resistant to heat and moisture, oil, grease and corrosive fumes. Write for samples or information. Rockbestos Products Corporation, 910 Nicoll St., New Haven, Conn.

Also refer to Electrical World Buyer's Reference.

IF YOU HAVEN'T SENT IN FOR YOUR COPY OF THE NEW NO. 10-E BULLETIN . . . WRITE TODAY!

AW ADEQUATE WIRING SERVES AND SAVES

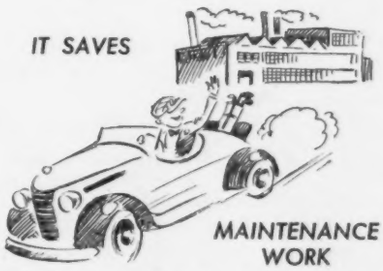
OTHER ROCKBESTOS FEATURES

IT IS HEATPROOF

Rockbestos insulation, made of asbestos, does not deteriorate under heat. It's flameproof, too.

IT IS PERMANENT

Rockbestos is always "as good as new" because asbestos is naturally time-resistant.



IT SAVES MAINTENANCE WORK

Rockbestos wired circuits eliminate frequent and expensive replacement.

IT IS VIBRATION-PROOF

Rockbestos insulation won't dry out, crack, open up, or fall off.

IT WILL NOT BLOOM

Rockbestos won't rot, bloom or swell under action of oil, grease or fumes.

ROCKBESTOS A.V.C.—*the wire with permanent insulation*

90.6% Light Reflection

Before and after a machine shop was painted with Luminall.

Send for Your Copy

FREE BOOKLET

• Every person who is consulted about lighting problems should have a copy of "Painting for Light & Decoration".

This 24-page, handsomely illustrated book tells about casein paint—why it reflects more light and diffuses it thoroughly. Gives scientific data on the action of light on casein paint.

You can recommend Luminall with confidence. It is so economical that it is a favorite in factories and warehouses. Yet it has such beauty that it is widely used in the finest stores, offices and homes.

We believe that you will find this book very useful—and like many others in the public service industry, can recommend it where its use is indicated.

NATIONAL CHEMICAL & MFG. CO.

3617 South May St., Chi.
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In Canada: Standard Paint & Varnish Co., Ltd., Windsor, Ont.

LUMINALL
for All Interiors

National Chemical & Mfg. Co.
3617 South May St., Chicago

Send booklet — "Painting for Light & Decoration".

Name & Title .....

Firm Name .....

Address .....

gineering problems for the state commission until 1937, when he joined the Bureau of Engineering of the FPC in similar activities.

▶G. J. OGLEBAY, who was recently elected a vice-president of the Public Service Co. of Indiana, has been named also to the board of directors. The election also was announced of Earl H. Conway as assistant comptroller. The board accepted the resignation of C. D. Porter as vice-president and director.

▶PAUL T. HOWE, manager of the plant of the West Tennessee Power & Light Co. at Humboldt, Tenn., for many years, has been named superintendent of the Humboldt municipal power plant, which will distribute TVA energy this month.

▶BURTON L. GAMBLE of South Boston, Va., sales promotion manager for the southern division of the Virginia Publice Service Co., has been appointed district manager of the company's properties at Lawrenceville, Va. J. R. SIMMONS, the present district manager at Lawrenceville, is retiring because of ill health. R. F. DOUGLAS of Alexandria, who has been connected with the Virginia Public Service Co. at that place for more than eight years, will replace Mr. Gamble in South Boston.

•

Three New General Electric Executives Take Office

R. M. Alvord, J. E. N. Hume and A. S. Moody, who recently were appointed commercial vice-presidents of the General Electric Co., have long service records with the G. E. organization.

Immediately after being graduated from Iowa State College in 1904, Mr. Alvord entered the G. E. test course at Schenectady and in 1906 he was transferred to San Francisco as a salesman. He became manager of the supply department there, then manager of the San Francisco district office and in 1936 manager of the newly created Pacific District of the company.

Mr. Hume has been manager of the industrial department of the company since 1935. Entering the company's test course in 1907, he later saw service in the switchgear and lighting departments in the Baltimore office. He entered the industrial department in 1912, then known as the power and mining department, and in 1928 was made manager of the motor division and the following year assistant manager of the department.

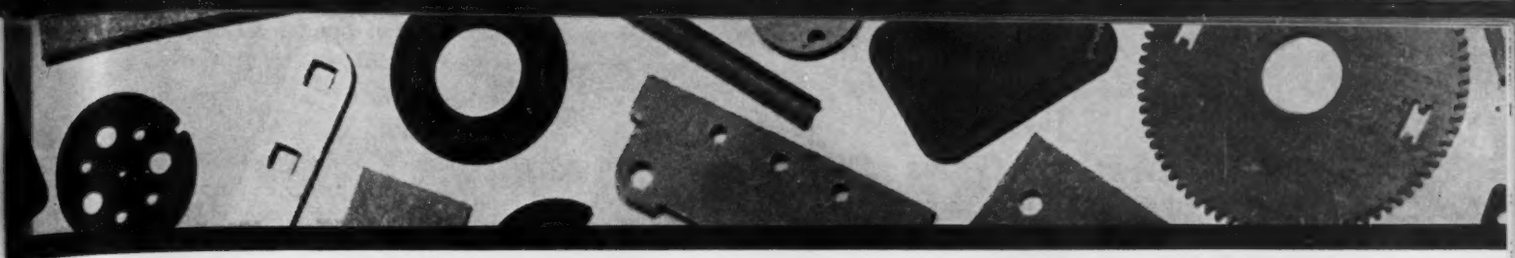
Mr. Moody has been manager of the northwest district since 1936, prior to which he was manager of the northwestern territory. He started work as a salesman in the San Francisco office of the Stanley G. I. Company in 1906. In 1907 he went with the supply department of the G. E. Co. at its San Francisco office and the following year was transferred to the Seattle office. In 1910 he was made manager of the supply department at the Portland office and in 1913 became assistant

R. M. Alvord

J. E. N. Hume

General Electric

A. S. Moody



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VULCANIZED FIBRE • PHENOL FIBRE
TAYLOR INSULATION • SILENT GEARS

Fabrication Service

Save machine hours, labor, rejects, assembly time, freight. Let Taylor fabricate your insulating parts "at the mill" to your specifications.

With experience second to none in the production and machining of vulcanized and phenol fibre—with the world's most modern mill of its kind, where every stage of production is laboratory-controlled—Taylor can assure uniformity of quality and accuracy of fabrication that facilitate assembly, reduce waste, provide dependable physical and electrical qualities.

Ask about Taylor "Planned Service" geared to your requirements—whether large or small—insuring an unfailing source of supply and prompt deliveries.

TAYLOR FIBRE COMPANY
NORRISTOWN, PA.

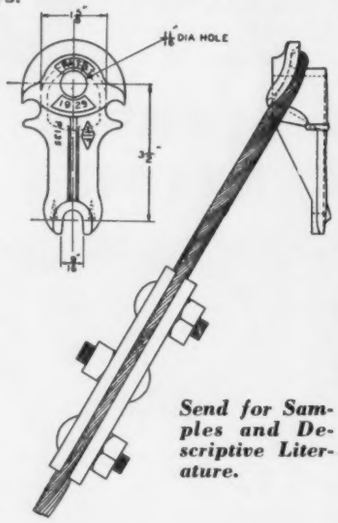
550,000 Installations Can't Be Wrong

M.I.F. Through-bolt Guy Hooks have been installed to this extent during the past three years in the U.S. and Canada by Operating Companies comprising a majority, expressed in terms of generating capacity or number of meter customers. We would recommend this neat, effective, economic, and hazard-minimizing guying method to those Companies that have not yet tried it. Investigation pays.

Guy Hooks—Three principal types in addition to the P134 Crossarm Guy Hook. P135 rated at 13,000 lbs. on ⅝" through-bolt is also approved for R.E.A. projects. P133 rated at 20,000 lbs. on ¾" through-bolt. P132 rated at 40,000 lbs. on 1" through-bolt. Make up guy loops on the ground and save time of the whole gang. Prices as low as 15c each in quantity.

Eye Nuts and Anchor Rods—Thimbleless Eye Nuts for ⅝" bolt as low as 12c each in quantity. Larger sizes for ¾" and 1" bolts. Double Eye Nuts and various types of Bolt Eyes also available. Also furnished assembled and galvanized as unit on special steel rods of any desired length, rated at 80,000 lbs. per sq. in. at correspondingly attractive prices. These Eyes, used with standard stocks of through-bolts, round out simple specifications for pole-to-pole guys, etc., other than anchor type served by the Guy Hooks.

Curved Washers—Full line of Curved Ribbed Malleable Washers using the metal to better advantage than plate washers of uniform thickness, minimizing the pole-splitting stresses of through-bolt guying of any type, and strictly competitive as to price.



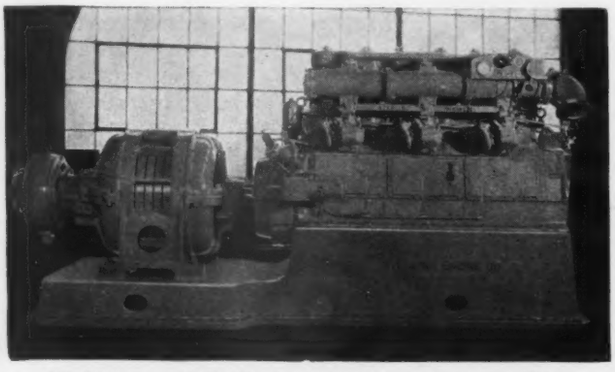
Send for Samples and Descriptive Literature.

Misc. M. I. F. Pole Hardware Specialties—*Williams Pole Mounts—Pole Stubbing Clamps—Aerial Cable Messenger Clamps and Insulated Hangers—Malleable Secondary Racks and Clevises—Malleable Crossarm Gains—Screw Anchors—Transformer Gain Plates and Kick Arms, etc.*

MALLEABLE IRON FITTINGS COMPANY
Pole Hardware Dept. [Factory and New England Sales Office] Branford, Connecticut
New York Sales Office: Thirty Church Street
Canadian Mfg. Distributor:
LINE & CABLE ACCESSORIES, Ltd., Toronto

UNDERWRITERS' LABORATORIES APPROVED

All Sterling gasoline engines, equipped with minor specialties, are approved by Underwriters' Laboratories —making the engines available for installation in large buildings, protecting elevator and lighting service, when outside power is interrupted.



200 K.W. General Electric Generator, driven by Sterling Viking 6-cylinder 425 H.P. 1200 R.P.M. gasoline engine for emergency.

Quick Starting Sterling Engines have been especially developed for standby or emergency service.

STERLING ENGINE COMPANY

Home Office and Plant, 1270 Niagara Street, Buffalo, New York. Dept. C-2 *Branch Office, 900 Chrysler Bldg., New York, N. Y.*

manager of the Portland office. In 1923 he was made manager of the Los Angeles office and the following year manager of the northwestern territory.

OBITUARY

►FRANK E. CRAFTS, formerly chairman of the municipal light board of Reading, Mass., died in that city recently.

►W. J. KYLE, power sales engineer, Public Utility Engineering & Service Corp., died January 6 at his home in Chicago, after a long illness. Mr. Kyle was well known in the electrical industry, having been engaged in electrical engineering and public utility research and sales activities since 1900. It was in 1928 that he became associated with Standard Gas & Electric's engineering and service organization as power sales engineer. He was a member of the power committee of the Edison Electric Institute, a member of the Petroleum Power Club, American Society of Heating and Ventilating Engineers, and was active in helping to form the Great Lakes Power Club.

►WILLIAM R. SEIGLE, chairman of the board and research director of Johns-Manville Corp., died December 26 in Rochester, Minn., following an operation on December 6. He was 59 years old. Mr. Seigle had been associated with Johns-Manville for nearly forty years. Advancing through the ranks, Mr. Seigle became vice-president in charge of factories and mines in 1917. He became chairman of the board of directors in 1929 and held both the chairmanship and the vice-presidency thereafter.

►R. C. CLIFTON, manager of the Ida Grove district of Iowa Public Service Co., died December 14. Mr. Clifton had charge of all construction and was the first superintendent of the Ida Grove Electric Co., formed in 1893. He established a city heating plant a few years later, which was sold to the Iowa Public Service Co. in 1924. Mr. Clifton took charge in 1934 of the entire Ida Grove district, consisting of Ida Grove, Battle Creek, Arthur and Danbury.

►R. M. KLEIN, commercial engineer of Triangle Conduit & Cable Co., Inc., New York, N. Y., died December 19, from a heart attack. Mr. Klein was a native of Johnstown, N. Y., and a graduate of Cornell University as electical engineer. He quickly transferred his interests from the engineering to the merchandising phase of the industry. Mr. Klein was sales manager for the Diehl Manufacturing Co. and general manager of the DeForest Radio Co. and Fada Radio Co.

THOMAS·INSULATORS

FOR THE ISOLATED LINE

Thomas Corrugated "Heavy-Disc" Suspension and Strain Insulators are especially designed to avoid costly servicing on hard to patrol lines. Their greater ruggedness and proven stamina minimize losses in service as well as those from breakage often encountered during construction under adverse conditions.

Where operating conditions are most severe, where continuity of service is imperative, that is where Thomas "Heavy-Disc" Types are required and can be given your toughest assignments. Their unexcelled performance under all conditions will materially reduce your maintenance costs.

Write for latest Engineering Data & Design Details.

THE R. THOMAS & SONS COMPANY

ENGINEERS MANUFACTURERS DESIGNERS

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GRAYBAR ELECTRIC CO., INC., Agents

The Pioneer Since 1875

OUR 66TH YEAR

Manufacturing AND MARKETS

Dip in Orders Shown by General Electric

Orders received by General Electric Co. during the fourth quarter of 1938 totaled $63,419,265, as against $73,997,063 in the last quarter of 1937, a decrease of 14 per cent, according to Gerard Swope, president.

Orders for 1938 totaled $252,176,223, as against $379,273,619 in 1937, a decrease of 34 per cent.

Mr. Swope stated that sales billed and net earnings for the year are not yet available, but will be given in the annual report for 1938, to be issued in the latter part of March.

•

Refrigerator Sales Increase Predicted

The electric refrigeration industry can expect an increase in sales volume of 20 per cent to 25 per cent in 1939, George W. Mason, president of the Nash-Kelvinator Corp., told distributors at the annual convention of the corporation's Leonard division recently in Detroit. Mr. Mason based his prediction on the present encouraging business signs.

He declared that dealers can now begin to tap a huge replacement market, which he estimates at 4,000,000 electric refrigerators. "The elements that made 1938 a poor year for the electric refrigeration industry are removed as far as 1939 is concerned," Mr. Mason said.

•

Frigidaire Opens Itinerant Four-Week Sales Convention

Three separate crews of Frigidaire representatives, each traveling in a different direction, left their headquarters at Dayton, Ohio, on January 13 for a four-weeks sales convention itinerary, carrying the story of 1939 Frigidaire products to more than 20,000 dealers and salesmen throughout the nation.

Heading the respective crews as leader and master of ceremonies for the convention program are: Lee A. Clark, household advertising and sales promotion manager; J. H. Walker, Jr., manager public utilities division, and Elsworth Gilbert, zone manager and general convention director. A total of 39 men will comprise the three groups. Thirty-three cities will be visited.

•

Seek Foreign Sales Outlets

Negotiations are going forward between ERPI and leading American manufacturers for the distribution, by ERPI's foreign distributing companies, of complete booth equipment in approximately fifty foreign territories, according to E. S. Gress, general foreign manager of Electrical Research Products, Inc.

•

Washer Show Opens

Predicting retail sales of 2,000,000 home laundering appliances in 1939, manufacturers opened this week their first National Washer and Ironer Show at the Stevens Hotel, Chicago.

Westinghouse Offers New Appliance Lines

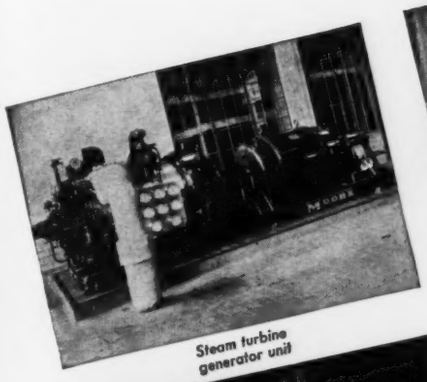
Presenting the 1939 line of Westinghouse Electric & Manufacturing Co. electric refrigerators, ironers and ranges last week at the Waldorf-Astoria Hotel, F. B. Williams, Jr., vice-president, estimated that manufacturers would sell 1,500,000 electric refrigerators and 360,000 electric ranges during the year.

Mr. Williams estimated that there were inventory stocks of only 120,000 refrigerators today, as compared with 600,000 of 1937 models on hand this time a year ago. He declared that the present situation is far different from the clogged market of a year ago when the last-year models had to be sold at greatly reduced prices, which disturbed the market throughout the year.

R. C. Cosgrove, manager of the household refrigerator department, declared that last year refrigerator sales totaled 1,200,000 units and that the market this year was favorable for increased sales. He pointed to the increase in wired homes and expanding

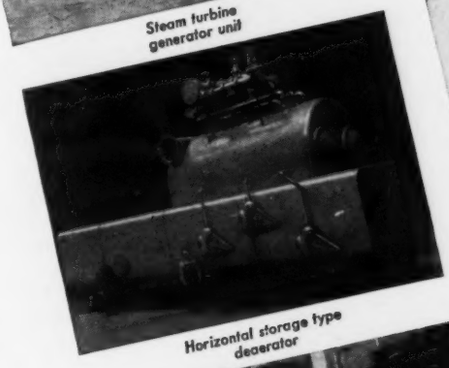
NEW MODELS—Estimates that 1939 would be a banner appliance year were made last week when Westinghouse introduced its new models. L. to r.—F. B. Williams, Jr., vice-president; R. C. Cosgrove, manager of refrigeration; W. J. Russell, manager of engineering, and Reese Mills, manager of range and water heaters

WORTHINGTON EQUIPMENT FOR THE POWER PLANT

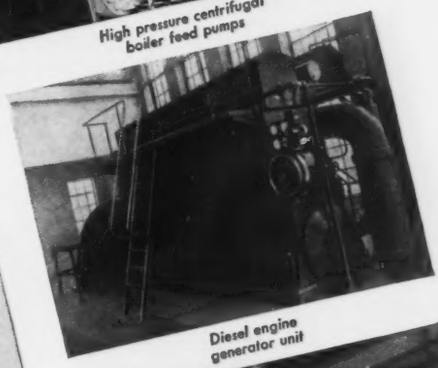

Steam turbine generator unit

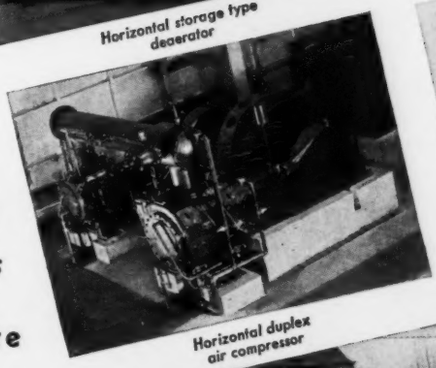
Single-pass surface condenser, with welded steel shell

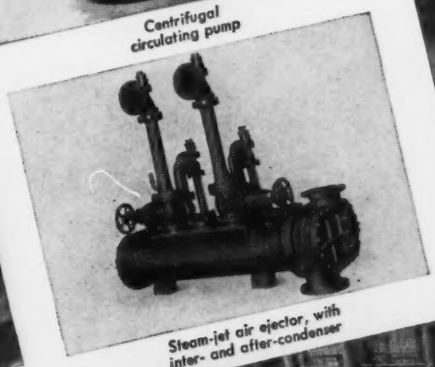
High pressure centrifugal boiler feed pumps


Horizontal storage type deaerator

Centrifugal circulating pump

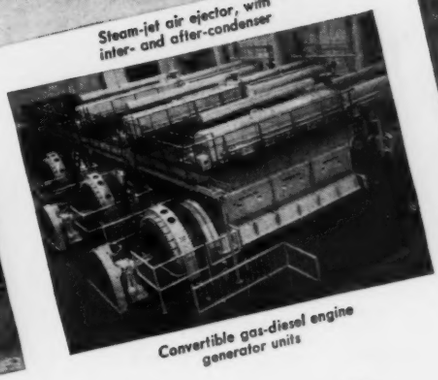

Diesel engine generator unit

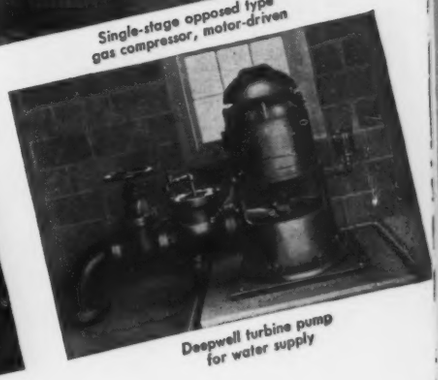

Horizontal duplex air compressor


Steam-jet air ejector, with inter- and after-condenser

Single-stage opposed type gas compressor, motor-driven

Portable air compressor operating pavement breakers


Convertible gas-diesel engine generator units


Deepwell turbine pump for water supply

100 *Years of Service to Industry*

•

STEAM TURBINES
STEAM CONDENSERS
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CENTRIFUGAL PUMPS FOR GENERAL USE
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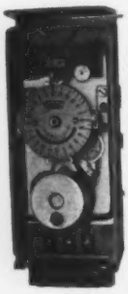
BIAS TAPES
with plenty of
STRETCH!

ACME bias tapes fit snugly around corners, into slots and over uneven surfaces because they have exceptional flexibility (stretch), and the tensile strength to stand the pull. These qualities are due to an Acme-developed process of applying pure vegetable oil varnishes of Acme formula to highest grade cotton fabric. Available in bias or straight tapes and rolls up to 36" wide — yellow or black. Samples if desired.

Acme Wire PRODUCTS

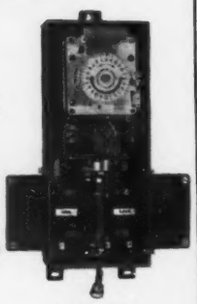
The Acme Wire Co., New Haven, Conn.
MAGNET WIRE—COILS—VARNISHED INSULATIONS—CAPACITORS

SAUTER
Time Switches



TYPE SY-15-1

FOR MULTIPLE OR SERIES STREET LIGHTING
and
All Other Time Switch Applications



TYPE ZM

TYPE HZ

The recognized leadership of SAUTER Time Switches has been attained and demonstrated through actual use in over 300,000 installations under every condition of service.

Complete Catalog on Request

TYPE SW

R. W. CRAMER & COMPANY, Inc.
67-69 IRVING PLACE NEW YORK, N. Y.

rural electrification as new markets yet to be sold.

An increase of 21 per cent in electric range sales was estimated by Reese Mills, manager of the range and water heater department. Mr. Mills stated that the long-range picture of the industry is definitely favorable for expanding range sales. He indicated that only about 10 per cent of the potential market for electric ranges has been sold.

The new line of ranges and refrigerators offers many improvements over the 1937 models. Attractive styling features all models.

•

Allis-Chalmers Gets City Plant Contract

City Commission of Lakeland Fla., has awarded $237,868 in contracts for the building of extensions and the modernization of the city-owned light and water plants. Harold L. Ickes, Public Works Administrator, verified a PWA grant totaling $167,040 to be added for the construction work. Revenue certificates, amounting to $325,000, have been issued and sold by the city.

Installation of a 5,000-kw. turbine-generator, $110,000, will be made by Allis-Chalmers Manufacturing Co. C. H. Wheeler Manufacturing Co., Philadelphia, was awarded the contract for new condenser machinery, $36,800. H. B. Trauger, a Lakeland contractor, was awarded the work of enlarging the light and water plant buildings, amounting to $18,588, and extending the underground electric cables, totaling $14,180. J. B. McCrary Co. of Atlanta will supervise the extension of water mains, $58,300.

•

Electric Truck Shipments

Domestic shipments of electric industrial trucks and tractors during November, as reported by ten manufacturers representing the entire industry, amounted to 36, as against 33 in October and 129 in November a year ago. For the first eleven months domestic shipments totaled 610, against 1,602 in the same period of last year.

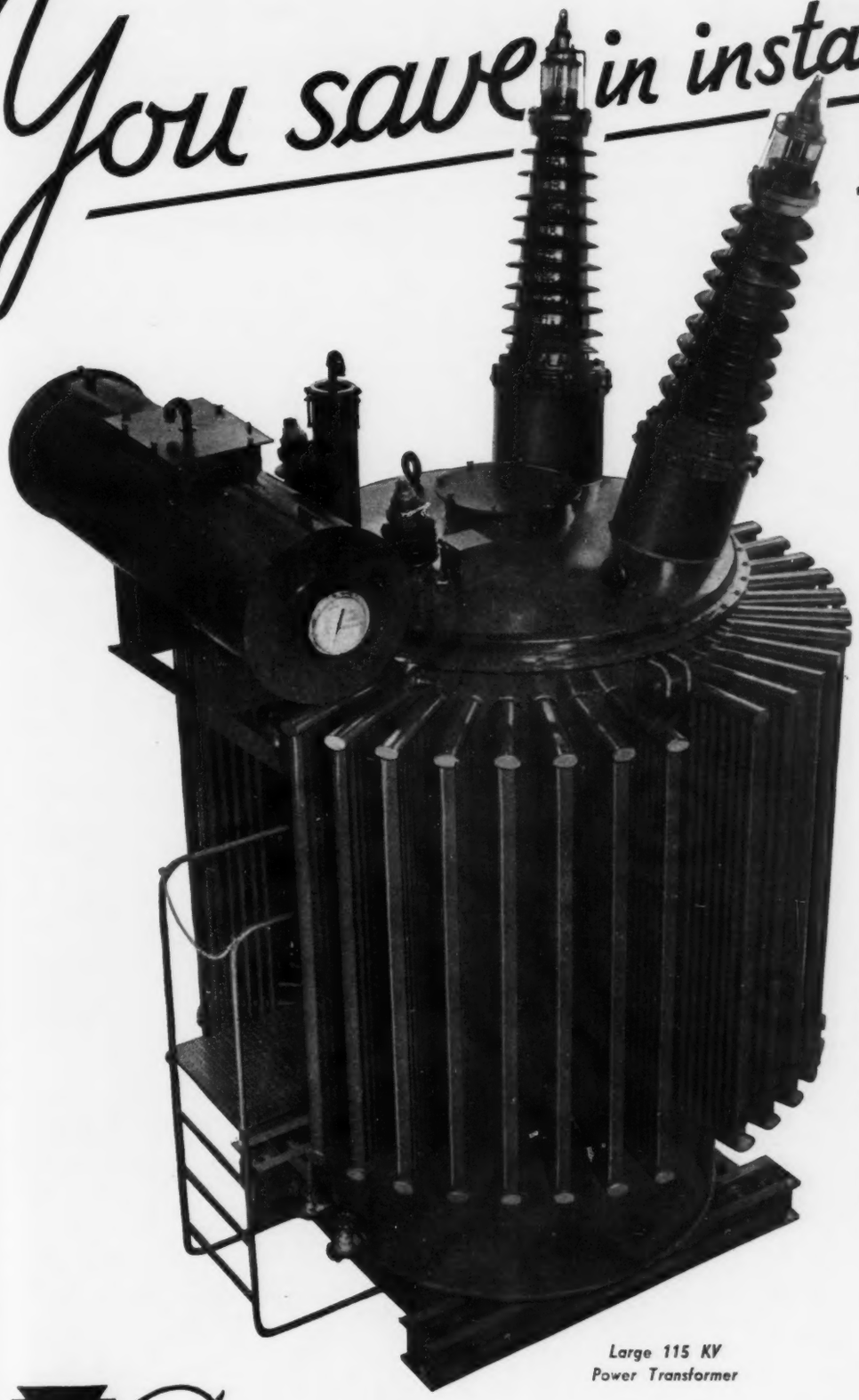
New York Metal Prices

	Jan. 10, 1939 Cents per Pound	Jan. 4, 1939 Cents per Pound
Copper electrolytic	11.25*	11.25*
Lead Am. S. & R. price	4.85	4.85
Antimony	11.75	11.75
Nickel ingot	35.00	35.00
Zinc spot	4.89	4.89
Tin straits	46.60	46.40
Aluminum, 99 per cent	20.00	20.00

* Delivered Connecticut Valley.

You save in installation costs

. . . because Pennsylvania Radiators are an integral part of tank!



Large 115 KV Power Transformer

NOTE the symmetrical arrangement of radiators, built of *13-gauge steel*. Please remember that Pennsylvania radiators are permanently welded to tank, making it possible to completely fill tank with oil *before* shipment, thus saving in installation costs.

PENNSYLVANIA TRANSFORMERS

Pennsylvania TRANSFORMER COMPANY

1701 Island Ave., N. S. Pittsburgh, Pa.

PREVENT CURRENT DIVERSION

with

STAR METER SEAL

There's no need to tolerate enormous losses through theft of current and meter jumping. Here's a porcelain cap that fits all CS type meters. Once in place, it must be mutilated or destroyed to be removed — a sure trap for the power thief. Millions of dollars are being saved annually by utilities that have installed Star Meter Seals. Write to our Meter Seal Dept. for sample and full information.

•

STAR INSULATING BEADS

Ball and Socket Beads for insulating bare wire. Heat resistant and high dielectric and mechanical strength. Thirteen sizes. Ask for price list and samples.

Makers of Electrical Porcelain Since 1899

The STAR PORCELAIN COMPANY
51 MUIRHEAD AVE., TRENTON, N. J.

Field Reports on Business

Industrial leaders are looking forward to a continuation of the upswing in business with expansion in trade in practically all lines. Utilities are preparing for another year of load-building activities, with sales of ranges, refrigerators and water heaters exceeding 1938 totals. Construction plans are likely to be expanded before the year is over.

NEW YORK

Business leaders got very little encouragement from the President's message to Congress last week. Many saw a continuation of past policies and a battle if changes are to be made in existing laws to give business a chance to go ahead.

Utility construction budgets are somewhat under last year, but indications are that the first estimates are by no means final. A good pick-up in business and cooperation from Washington would start a wave of utility construction which would surpass any in recent years. Many large projects are being contemplated, with others being held as plans awaiting a more favorable outlook.

Electrical appliance manufacturers are optimistic regarding sales this year. Refrigerator sales are estimated to run up to 20 per cent ahead of 1937. The new streamlined models are expected to catch the customer's eye. Electric ranges and water heaters are expected to move in greater volume than in 1937. Aggressive sales and advertising campaigns are soon to get under way.

The general economic picture is considered brighter, with the upward swing in business expected to continue for some time. Engineering awards are running ahead of 1937. New home building is expected to provide a good market for home electrical appliances and additional electric load for the utilities.

The $23,500,000 construction budget of New Jersey Public Service contains $12,000,000 for the installation of a 100,000-kw. turbo-generator for the Burlington stations.

CHICAGO

The outlook for business in this area is highly promising as the new year gets under way. Post-holiday business was unusually good and sentiment was helped considerably by the way in which industrial activity picked up at the beginning of the year. Steel production moved upward sharply to approximately double the output a year ago. Employment and payrolls continued the gains registered in the final quarter of 1938.

Inventories are a pleasant contrast from the position a year ago. This year stocks are low and prices steady, which augurs well for production schedules for the next few months at least. Retail sales in this district for the last month of the year were approximately 2 per cent above the comparable period in 1937.

Electrical manufacturers are looking forward to a good year as orders and inquiries continue to increase. Industrial lighting equipment is showing steady improvement. Interest in heavy apparatus has picked up considerably, according to reports from manufacturers. One company received an order for a 25,000-kw. steam turbine to cost $500,000, while another reports a sale of substantial volume including switchgears and transformers. Appliance sales are holding up well, with present indications that the volume will surpass last year by a substantial margin. The demand for fluorescent lighting equipment is especially heavy and manufacturers are increasing production to supply orders.

NEW ENGLAND

Contract for 9 miles of transmission line extending from Middleboro, Mass., to New Bedford has been awarded for $26,500. A Massachusetts industrial plant recently purchased 1,500 100-watt G.E. Vaporlamp fluorescent tubes for installation in March to deliver lighting intensity of 30 ft.-candles.

A new electrically driven escalator is being installed at the Park St. subway station, Boston; the Court Square Press has purchased 15-hp. air-conditioning equipment for its plant. Adequate wiring movement is gathering impetus for spring activity in Massachusetts; many projects which will require encouraging volumes of wiring supplies for power and light are in prospect, one of which, a new private housing program involving about $1,000,000, will be commenced at an early date.

Inquiries for industrial equipment are being received in good volume according to one prominent representative. Small motor sales are steady and electrical pumping units are being considered for several Massachusetts municipalities.

Merchandising is progressing; leaders in interest reported by one prominent distributor are indicated by an encouraging trend in sales in electrical laundering equipment and small cooking appliances. In the Vermont area December sales show a gain over last year in range sales, with water heaters and refrigerators receiving much attention.

PACIFIC COAST

San Francisco building permit volume registered 15 per cent advance in 1938 over 1937, with one-family frame dwellings showing 30 per cent increase and providing two-thirds of the total despite many exposition contracts. An especially encouraging item was 40 per cent increase in privately owned commercial structures, and a $500,000 Los Angeles department store is outstanding among such recent contracts.

Government awards will be made shortly on 52 miles of 69,000-volt No. 4/0 transmission line for the Colorado-Big Thompson project and 142 miles of 115,000-volt 250,000-circ.mil transmission line from Seminoe Dam to Cheyenne. Awards include $20,566 Moloney transformers, arresters and other substation equipment for Big Thompson project, $1,814,493 by city of Los Angeles to Bethlehem for third line steel towers from Boulder Dam, a switch and signal system connecting San Francisco municipal cars with Bay Bridge Interurban terminal, whose transpontine service begins January 15; $17,990 for furnishing and installing steam generator set in San Francisco relief home, and $50,765 for wiring and lighting fixtures in the $664,289 new state office building in Olympia, Wash.

SELECTION
THE first basic step in building the quality of AmCreCo Products is taken in the forests. It is there that skilled, experienced woodsmen carefully select the finest raw materials for our creosoted poles, piles, and timber. The importance of careful selection has been proven as surely as the importance of proper handling and sound treatment have been proven. By recognizing facts like these, AmCreCo can give you the finest creosoted poles, piles, and timber it is possible to produce. Ask about them!
AMERICAN CREOSOTING COMPANY
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AmCreCo Full Length Pressure Treated Poles

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POWER CABLE
PAPER INSULATED
VARNISHED CAMBRIC INSULATED

TELEPHONE CABLE
BARE COPPER WIRE AND CABLE
WEATHERPROOF WIRE AND CABLE
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"QUALITY ABOVE SPECIFICATIONS"

KENNECOTT WIRE AND CABLE COMPANY
SUBSIDIARY OF KENNECOTT COPPER CORPORATION
PHILLIPSDALE, RHODE ISLAND
New York, 10 East 40th St. - Chicago, 140 South Dearborn St. - Cincinnati, Traction Bldg.

Specify this Burndy
GROUND CLAMP
• Inexpensive, sturdy, non-corrosive
• May be slipped over top or around side of conductors
• Also available with hollow-head screw and special wrench
TYPE GH
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Prices and Full Information
Upon Request
BURNDY
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459 EAST 133d STREET, NEW YORK, N.Y.

On Returning to Pre-New Deal Conditions

[*Continued from page 65*]

time when it refuses to sanction the amendment of the Constitution by Congress and the President; a return to the time when it gives consideration to the actual violations of the Constitution, and not merely to the professed activities under it by governmental agencies, will not be a retrogression, but a forward movement.

Furthermore, if the people are to escape the "somewhere" designated by "hell-bent," there must be a recovery of the determination, spirit and motive that made possible the social, economic and industrial progress recounted in the Time Capsule which the Westinghouse company has buried on the grounds of the New York Exposition. There it is recounted that:

"Our engineers and inventors have harnessed the forces of the earth and skies and the mysteries of nature to make our lives more pleasant, swift, safe and fascinating beyond any previous age. We fly faster, higher and farther than the birds. On steel rails we rush safely behind giant horses of metal and fire. Ships large as palaces thrum across the seas. Our roads are alive with self-propelling conveyances so complex the most powerful prince could not have owned one a generation ago; yet in our day there is hardly a man so poor he cannot afford this form of personal mobility.

"Over wires pour cataracts of invisible electric power, tamed and harnessed to light our homes, cook our food, cool and clean our air, operate the machines of our homes and factories, lighten the burdens of our daily labor, reach out and capture the voices and music of the air, and work a major part of all the complex magic of our day.

"We have made metals our slaves, and learned to change their characteristics to our needs. We speak to one another along a network of wires and radiations that enmesh the globe, and hear one another thousands of miles away as clearly as though the distance were only a few feet. We have learned to arrest the processes of decay; our foods are preserved in metal or frost, and by these means we may have vegetables and fruits in any season, delicacies from foreign lands, and adequate diet anywhere."

These are only a few of the achievements of individual effort, enterprise, initiative and resourcefulness under the conditions antedating the New Deal, and if a recapture of that spirit is a return to pre-New Deal consideration, then let's go back a-running.

C. M. JANSKY.

BANK ON ITS
DEPENDABILITY

● BUILT BY
BALDOR ELECTRIC CO.

When bearings were selected for this totally-enclosed Baldor Streamcooled Motor, consideration was given to material and workmanship. For, while a constant stream of cool air protects this motor against *heat*, the bearings must protect it against *wear* on rotating parts.

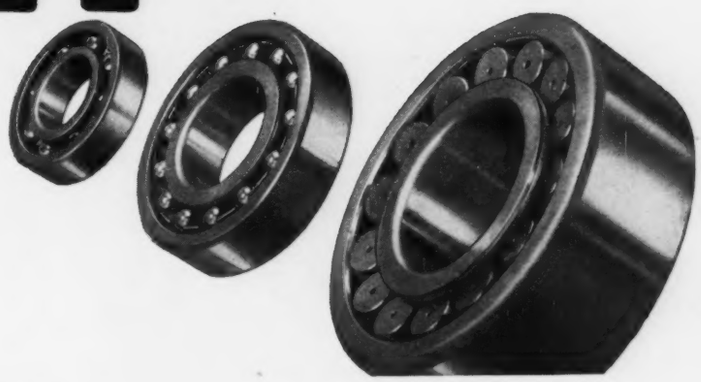
Its SKF Bearings consist of high carbon chrome steel specially hardened for maximum strength and resistance to wear, and their internal clearance is controlled by SKF factory precision assembly.

The result is that a uniform air gap is positively maintained. Only occasional lubrication is needed. And starting is easier and smoother with less line disturbance. In short, SKF *again* puts the right bearing in the right place. 4236

SKF INDUSTRIES, INC., PHILADELPHIA, PENNA.

THE BEARINGS ARE
SKF

BALL & ROLLER BEARINGS



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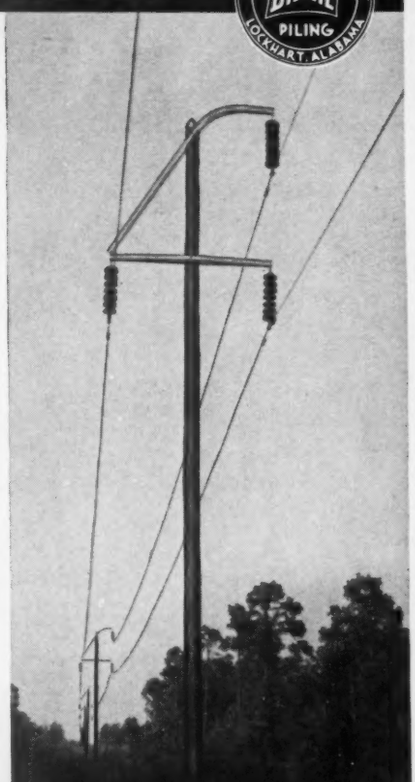

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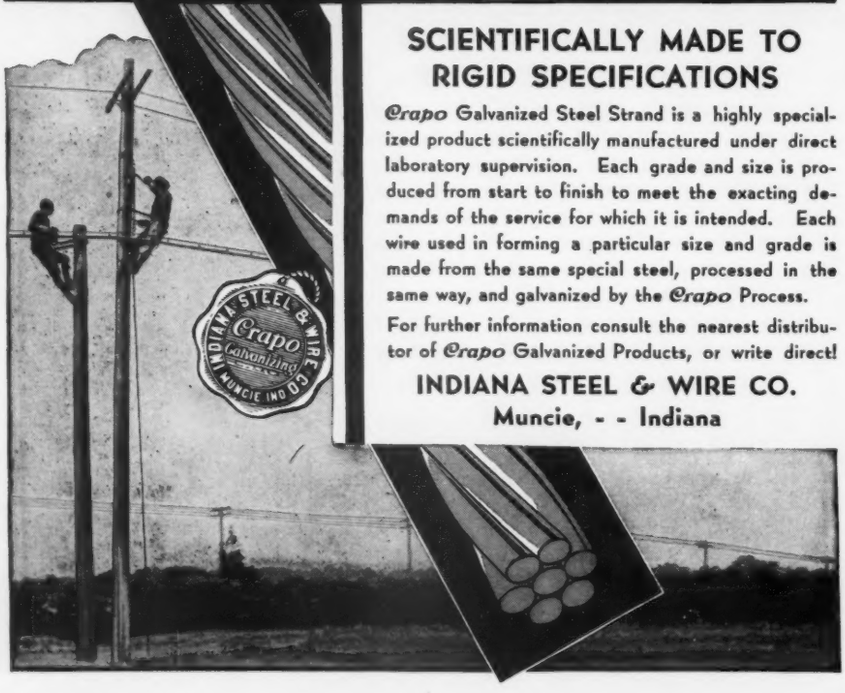

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New REA Allotments Made; Contracts Let

Allotments totaling $3,447,000 for 30 projects in fourteen states have just been announced by REA.

Among the allotments were the following:

ALABAMA—South Alabama Electric Membership Corp., Troy, J. H. Schuessler, superintendent, $239,000 to build 265 miles of line, 1,008 members in Covington, Crenshaw, Pike, Coffee and Bullock counties.

ARKANSAS—Southwest Arkansas Electric Co-operative Corp., Garland, Calvin M. Hervey, Jr., superintendent, $267,000 to build 228 miles of line, 989 members in Polk, Sevier, Howard, Hempstead, Miller, Lafayette counties, Ark., and Bowie County, Tex. Arkansas Valley Electric Co-operative Corp., Ozark, Wallace M. Milton, superintendent, $170,000 to build 159 miles of line, 577 members in Logan, Johnson, Crawford and Franklin counties.

KENTUCKY—Jackson County Rural Electric Co-operative Corp., McKee, Coleman Reynolds, president, $188,000 to build 131 miles of line, 931 members in Jackson, Laurel, Clay and Rockcastle counties. Salt River Electric Co-operative Corp., Inc., Bardstown, R. F. Frizzell, superintendent, $135,000 to build 127 miles of line, 413 members in Spencer, Washington, Bullitt and Nelson counties. Taylor County Rural Electric Co-operative Corp. Inc., Campbellsville, Ferrill Greagory, superintendent, $151,000 to build 138 miles of line, 570 members in Taylor, Casey, Lincoln, Green and Adair counties. West Kentucky Rural Electric Co-operative, Mayfield, E. C. Ray, president, $219,000 to build 198 miles of line, 973 members in Graves, Calloway, Marshall and Hickman counties.

MISSISSIPPI—Jones County Electric Power Association, Laurel, A. F. Walters, president, $190,000 to build 230 miles of line, 737 members in Jones and Perry counties. Twin County Electric Power Association, Hollandale, H. G. Woodruff, superintendent, $170,000 to build about 186 miles of line, 783 members in Humphreys, Washington, Sharkey and Issaquena counties.

MISSOURI—Ozark Electric Co-operative, Mt. Vernon, W. L. Boucher, superintendent, $263,000 to build 245 miles of line, 861 members in Dade, Lawrence, Greene, Polk, Cedar and Christian counties. Macon Electric Co-operative, Macon, Preston V. Walker, superintendent, $231,000 to build 228 miles of line, 610 members in Macon, Linn, Shelby and Randolph counties.

NEBRASKA—Hall County Rural Public Power District, Wood River, Charles X. Miller, president, $164,000 to build 121 miles of line, 358 members in Hall County. Seward County Rural Public Power District, Seward, L. C. Geis, president, $274,000 to build 228 miles of line, 532 members in Seward, York and Lancaster counties.

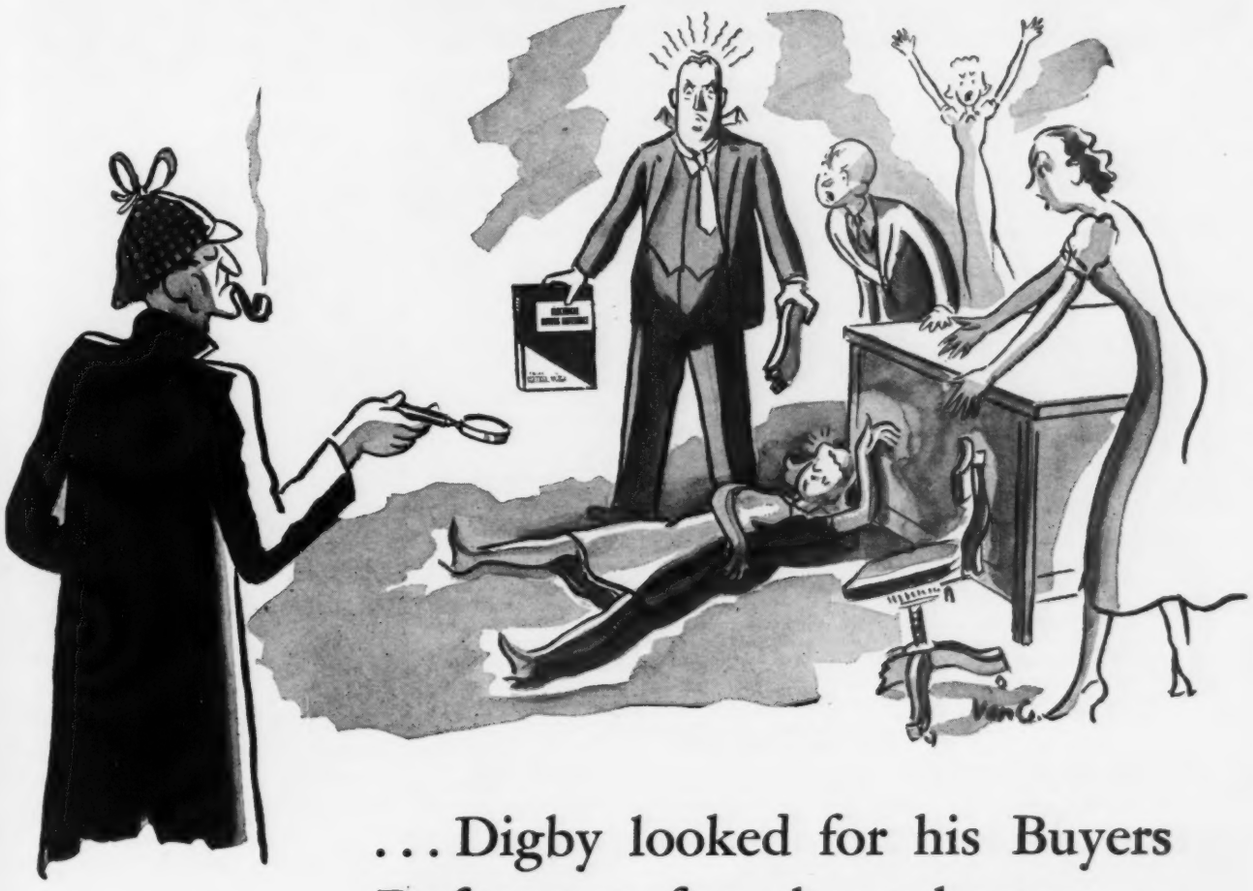
TEXAS—Hill County Electric Co-operative, Inc., Itasca, E. D. H. Farrow, superintendent, $114,000 to build 142 miles of line, 396 members in Ellis, Hill and Dallas counties. Wood County Electric Co-operative, Inc., Quitman, V. B. Shaw, superintendent, $118,000 to build 126 miles of line, 494 members in Franklin, Van Zandt, Wood, Titus and Smith counties.

WISCONSIN—Wisconsin Power Co-operative, Chippewa Falls, Edward B. Wayts, superintendent, $200,000 to finance an additional unit to the generating plant.

Construction contracts:

Hart County Electric Membership Corp., Hartwell, Ga., George Bell, supt., and J.

"Justifiable homicide, Watson . . .



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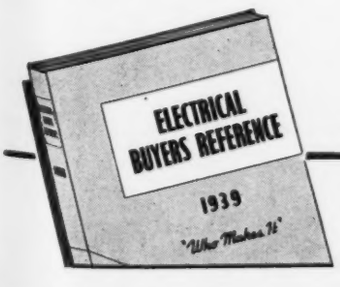

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B. McCrary Engineering Corp., Atlanta, engineer, contract to Roy Richards, Carrollton, Ga., for building second section of project, 256 miles of line, 709 members; bid $158,437.

Jackson Electric Membership Corp., Jefferson, Ga., R. J. Kelly, supt., and J. B. McCrary Engineering Corp., Atlanta, engineer, contract to W. A. Mathis, Athens, Ga., for building first section, 171 miles of line, 664 members; bid $107,015.

Kootenai Rural Electrification Assn., Inc., Coeur d'Alene, Idaho, Jesse Vetter, supt., and Allan Sickler, Alturas, Calif., engineer, contract to Homer G. Johnson, Portland, Ore., for building first section, 185 miles of line, 600 members; bid $135,525.

LaGrange County Rural Electric Membership Corp., LaGrange, Ind., J. R. Hayes, supt., and Indiana Statewide REMC, Indianapolis, engineer, contract to Contracting and Materials Co., Evanston, Ill., for building two sections, 252 miles of line, 735 members; bid $194,710.

Parke County Rural Electric Membership Corp., Rockville, Ind., Reuben Dooley, supt., and Indiana Statewide REMC, Indianapolis, engineer, contract to Miller-Baxter, Inc., Indianapolis, for building first section, 274 miles of line, 810 members; bid $238,735.

Sioux Electric Co-operative Assn., Hawardon Iowa, O. K. Battern, supt., and K. R. Brown, Des Moines, engineer, contract to Evans Construction Co., Early, Iowa, for building entire project, 234 miles, 495 members; bid $162,632.

Harrison County Rural Electric Co-operative Corp., Cynthiana, Ky., G. L. Bridwell, supt., and Ray W. Chanaberry, Louisville, contract to F. W. Owens Co., Louisville, for building entire project, 194 miles, 579 members; bid $125,899.

Carlton County Co-operative Power Assn., Kettle River, Minn., Matt O. Wilson, manager, and Federated Electric Co-operative Association, Minneapolis, engineer, contract to Franzen Brothers, Palisade, Minn., for building second section, 253 miles, 500 members; bid $164,138.

Fillmore County Co-operative Electric Assn., Preston, Minn., Earl J. Kjos, manager, and Toltz, King & Day, St. Paul, and Banister Engineering Co., engineers, contract to Langford Electric Co., Minneapolis, for building section, 204 miles, 390 members; bid $146,472.

Peoples Co-operative Power Assn., Inc., Rochester, Minn., Frank I. Kiley, supt., and Ellerbe & Co., St. Paul, engineer, contract to Cater Construction Co., Kansas City, Mo., for building second section of project, 166 miles of line, 378 members; bid $134,427.

Consolidated Electric Co-operative, Mexico, Mo., Midwestern Engineering & Construction Co., Tulsa, Okla., engineer, contract to Phelan Construction Co., Davenport, Iowa, for building first section 243 miles of line, 550 members; bid $164,182.

Cooke County Electric Co-operative Assn., Muenster, Tex., J. W. Hess, supt., and William G. Morrison, Waco, Tex., engineer, contract to J. E. Morgan & Son, Waco, Tex., for building entire project, 197 miles of line, 450 members; bid $108,197.

Grant County Co-operative Rural Electric Assn., Lancaster, Wis., Earl E. Raisbeck, supt., and Wisconsin Development Authority, Madison, engineer, contract to L. G. Arnold, Inc., Eau Claire, Wis., for building second section, 246 miles of line, 596 members; bid $166,000.

Eau Claire Electric Co-operative, Eau Claire, Wis., F. R. McFarland, supt., and Wisconsin Development Authority, Madison, engineer, contract to L. G. Arnold,

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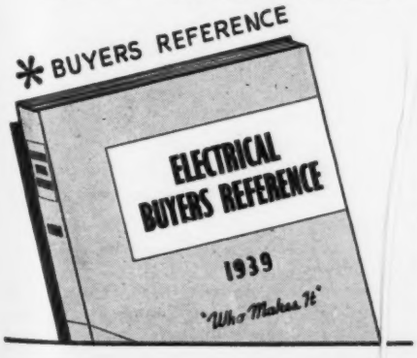

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Inc., Eau Claire, for building entire project, 272 miles of line, 703 members; bid $207,549.

Cumberland Electric Membership Corporation, Clarksville, Tenn., M. C. Northington, superintendent, contract to John Oman, Jr., Nashville, Tenn., for building first section of project, 320 miles of line, 750 customers; bid $202,669.

Southside Electric Co-operative, Blackstone, Va., C. S. Hooper, superintendent, contract to Rockingham Construction Company, Harrisonburg, Va., for building another section of project, 358 miles of line, 1,074 customers; bid $266,642.

Dunn County Electric Co-operative, Menomonie, Wis., Martin B. Rotnem, superintendent, contract to E. W. Wylie, Inc., St. Paul, Minn., for building another section of project, 191 miles of line, 590 customers; bid $136,139.

●

Sales Opportunities

HARTFORD, CONN.—Hartford Electric Light Company is arranging fund of about $1,000,000 for expansion and improvements in plants and system during 1939, a considerable part of appropriations to be expended for extensions in transmission and distributing lines, power substation units and increased service facilities.

MUSCATINE, IOWA—Has plans maturing for extensions and improvements in municipal electric power plant, including installation of new 7500-kw. generator unit and auxiliary equipment. Cost about $482,000, of which approximately $229,000 will be represented by a Federal grant. Young & Stanley, Inc., Muscatine, is consulting engineer.

DAYTON, OHIO—Quartermaster Corps, Wright Field, Dayton, plans addition to power plant, including installation of equipment for increased capacity. Fund of about $3,000,000 is being arranged for this and other utilities at local Government aircraft field, and for new test hangar.

PECOS, TEX.—Red Bluff Water Power Control District, Pecos, receives bids until January 23 for primary and secondary lines in parts of Pecos, Ward and Reeves Counties, including power substation facilities. J. D. Shaw is chief engineer.

WASHINGTON, D. C.—Bureau of Yards and Docks, Navy Department, receives bids until January 18 for four oil-fired boiler units, each with capacity of 600 pounds of steam per hour, air preheaters, draft fans, boilers and auxiliary equipment, including combustion control apparatus, for installation in power plant at navy yard, Pearl Harbor, T. H. (Specifications 9074).

SEAFORD, DEL.—E. I. duPont deNemours & Company, Rayon Department, duPont Building, Wilmington, Del., plans steam-electric power plant at new mill for Nylon Division at Seaford, where large tract of land recently was acquired. Work is scheduled to begin soon on main one-story unit, totaling 300,000 square feet of floor space, with installation to include motors and controls, conveyors and other equipment, with modernized factory lighting system. Proposed to have buildings ready for machinery installation in fall of 1939. Entire project will cost about $8,000,000. Company engineering department, first noted address, is in charge.

INDIANAPOLIS, IND.—Central Indiana Power Company, Indianapolis, plans extensions in primary and secondary lines

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Frequently Used—"My 1937 copy was frequently used. The improved binding, etc., for 1938 seems a worthwhile improvement," writes a New York Power Company.

Invaluable to Engineering Dept.—"The book is of invaluable assistance to us here in our Department," writes Engineer of Power & Light Co., in Washington.

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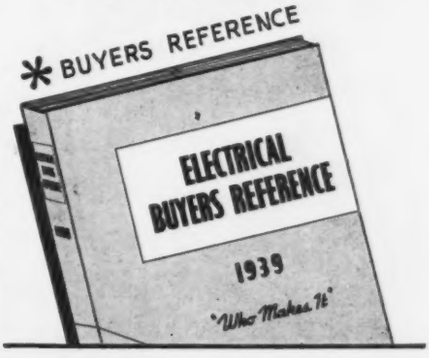

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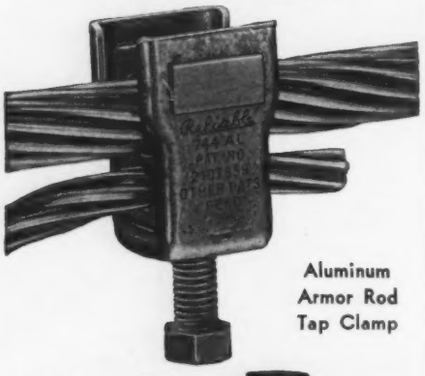

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for rural electrification in group of ten counties, including power substation units and service facilities. Entire project will comprise about 500 miles of lines in all and is scheduled to be carried out early in 1939. It is proposed to arrange financing through Federal aid in amount of $430,000 for program.

OSAWATOMIE, KAN.—Will take bids soon on revised plans for extensions and improvements in municipal electric power plant, including installation of equipment for increased capacity. Bids recently received have been rejected. Cost estimated close to $200,000. Burns & McDonnell Engineering Company, 107 West Linwood Boulevard, Kansas City, Mo., is consulting engineer.

WASHINGTON, D. C.—Navy Department plans an extensive expansion and improvement program at all major navy yards in different parts of country during 1939, with total expenditure to approximate $107,000,000, to be secured from regular appropriation, regular navy public works fund, funds from second deficiency and approximately $56,000,000 from PWA and WPA. Work will comprise four general projects, including power plant extensions and improvements, with installation of additional electric generating units and accessories, replacement of number of existing boiler station installations and additional boiler units, replacements and extensions in distribution and power substation facilities; new shipways and auxiliary structures; waterfront rehabilitation; and weight-handling facilities. New buildings will be constructed for shop service, with installation of heavy duty and other motors and controls, convevors, transmission apparatus and other equipment. Program will be carried out under direction of Bureau of Yards and Docks.

HARTFORD, CONN.—Connecticut Light & Power Company will arrange an appropriation of about $1,728,000 for extensions and improvements in power plants, power substations and switching stations, transmission and distributing lines and other structures during 1939. Work is scheduled to be placed under way at early date.

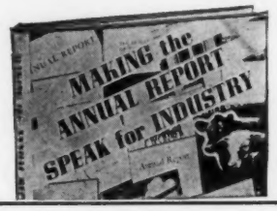
SPOKANE, WASH.—Washington Water Power Company has authorized an appropriation of about $200,000 for expansion and improvements, of which approximately $130,000 will be used for installation of new equipment in hydroelectric generating stations, and $70,000 for extensions in power substations and switching stations, and transmission lines.

AMHERST, OHIO—Has plans nearing completion for new municipal electric power plant. Cost about $145,000, with equipment. Financing is being arranged. Floyd G. Browne, Marion, Ohio, is consulting engineer.

NORWICH, CONN.—Plans extensions and improvements in primary and secondary lines in different parts of territory now being served, including additional power substations and service facilities. Cost about $753,770, a portion of fund to be secured through Federal aid.

COLORADO SPRINGS, COLO.—Will begin work soon on extensions and improvements in municipal hydroelectric generating station, with installation of new 2000-kw. generating unit, with hydraulic turbine and auxiliary equipment; new 24-inch high-pressure steel pipe line and miscellaneous apparatus. Cost about $469,800, of which $211,405 will represent a Federal grant.

ST. LOUIS, MO.—Hyde Park Breweries



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Association, Inc., 2210 Salisbury Street, plans installation of motors and controls, conveyors, electric hoists, loaders and other equipment in connection with expansion and improvements in plant, including new buildings. Cost about $500,000. Work is being placed under way at once.

COLUMBUS, NEB.—Loup River Public Power District, 2307 Thirteenth Street, Columbus, D. J. DeBoer, chief electrical engineer, has approved plans for primary and secondary lines in parts of Platte and Colfax Counties, totaling about 164 miles, and will begin work soon.

CHARLOTTESVILLE, VA.—Northern Piedmont Electric Cooperative, Inc., Charlottesville, plans new power substation for distribution in connection with line extensions in rural areas. Fund of $160,000 has been arranged through federal aid for project. Company operates in Albemarle, Greene, Culpeper, Madison and neighboring counties.

LAKELAND, N. J.—Board of County Freeholders, Camden, N. J., is arranging immediate call for new bids for proposed steam-electric power plant at institution at Lakeland. Bids recently received have been rejected. Cost close to $390,000, with equipment, and financing in that amount has been arranged. Perring & Remington, Inc., Camden, is consulting engineer.

CHIPPEWA FALLS, WIS.—Wisconsin Power Co-operative Association, Chippewa Falls, plans installation of additional equipment in local steam-electric generating station. Fund of $200,000 has been secured through federal aid. Proposed to begin work soon. E. B. Wayts, Tenney Building, Madison, Wis., chief engineer, Wisconsin Rural Electric Administration, is engineer in charge.

•

Municipal Plants

NEW BRITAIN, CONN.—Board of Finance and Taxation at the request of Mayor George J. Coyle has approved a survey and study by experts to secure data concerning the advisability and feasibility of setting up a municipal power plant.

LA SALLE, ILL.—Illinois Supreme Court has held that the city failed to get authority in a special election to issue up to $925,000 in mortgage certificates to finance a proposed municipal light plant. The ruling was made on an appeal from a La Salle County Circuit Court recount. The opinion, written by Justice Warren H. Orr and giving detailed consideration to disputes over marking of ballots and deduction of votes, held the proposition failed to receive a majority by 1 363/1000 of a vote.

MIDDLESBORO, KY.—Efforts of the city to obtain TVA power through erection of a city distribution system were blocked again when Circuit Judge James M. Gilbert made permanent an injunction granted the Kentucky Utilities Co. sometime ago. The case will be taken to the Court of Appeals for final settlement, it was stated. Middlesboro sought to issue $175,000 in bonds and to obtain a grant of $89,000 from the PWA for the building of the system. The right to erect a power plant was denied sometime ago, and afterward efforts were concentrated on a distribution system with plans to purchase power from TVA.

UNION CITY, MICH.—Village gave consumers a dividend of free service for the last half of December from profits of the municipal hydro-electric plant.

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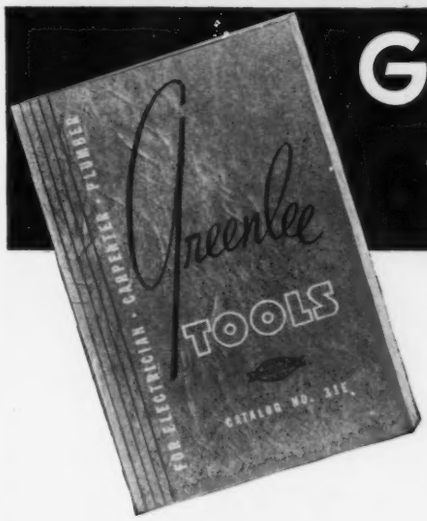

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WELLINGTON, OHIO—For the third successive year, the more than 900 patrons of the municipal electric plant received energy free during December as a Christmas gift. Bills approximating $5,000 were stamped paid before they were mailed out January 1.

MIDDLETOWN, OHIO—A taxpayer has filed a suit to enjoin the city commission from certifying to the board of elections the referendum petition seeking repeal of an ordinance authorizing a bond sale for construction of a municipal light plant. The suit sets out that the referendum was not filed properly and that the ordinance is not subject to referendum.

MONROEVILLE, OHIO — Village council has granted the petition of a large number of voters for a referendum on a proposal for the construction of a municipal electric power plant at an estimated cost of $80,000. The village is now served by the Ohio Public Service Co. under a ten-year contract which advocates of the municipal plant contend is illegal. The village has been awarded a $35,000 PWA grant for the proposed plant and would issue mortgage revenue bonds for the remainder of the cost. Election was set for February 14.

NORTH BALTIMORE, OHIO—Village council will allow voters to decide the question of municipal ownership of the electric facilities, and has set February 14 as the date for a special election.

DRUMWRIGHT, OKLA.—A permanent injunction has been granted in district court at Sapulpa to W. D. Tharel and a group of taxpayers in an action to prevent the city from issuing bonds for approximately $150,000 for the construction of a municipal light plant. A proposal to supplement grants from the federal government for construction of the plant with an issue of bonds carried in the September election, but a temporary restraining order was issued by the court sometime ago. The application of the city for a PWA grant, which the bonds would have supplemented, has since been refused.

TEXARKANA, TEX. — Federal District Judge Randolph Bryant has ruled that the city has the right to construct its own municipal power plant. His decision upheld City Attorney E. B. Levee against the Southwestern Gas & Electric Co., which sought to prevent the municipality from building its own plant. The city would build a power plant costing $545,000. Of this sum Texarkana will receive a grant of $245,000 from the government and a PWA loan of $300,000. Attorneys for the utilities announced they would appeal Judge Bryant's ruling.

WACO, TEX.—By a vote of 3 to 1, City Commission has adopted a resolution providing that when the Lower Colorado River Authority, the Brazos River Conservation and Reclamation District or other agencies are in position to offer a definite proposal to the city to furnish electric energy at a satisfactory rate, the city will submit to the voters a proposal to issue bonds for the acquisition or construction of a municipally-owned power distribution system.

GALAX, VA.—Appalacian Electric Power Co. has been granted an appeal by the Virginia Supreme Court of Appeals in the controversy between the company and the town, concerning the proposal of the town to erect an electric distribution plant for its citizens. The case was brought before the Appellate Court from the circuit court of Giles County, where the company had been denied an injunction which it sought to prevent the town from issuing bonds and establishing an electric distribution plant in competition with the plant which the company now has. The granting of the appeal means the case will be docketed for argument in the Supreme Court of Appeals.

●

Recent Rate Changes

WEST VIRGINIA PUBLIC SERVICE COMMISSION has estimated in its biennial report that utility customers of the state have been saved a minimum of $3,118,000 annually for the last five years by rate reductions. Notwithstanding the reductions in revenues to the utilities caused by the customer savings, the commission said, the utilities of the state as a whole are in better condition today than they were in June, 1933. They have prospered and expanded their plants, and are giving wider and better service at lower rates in spite of materially increased taxes.

NAPOLEON, OHIO, through its Board of Public Affairs, has ordered a 10 per cent reduction in electric rates, revealing that operating expenses at the municipal power and water plant have been considerably reduced. Reduction will provide a saving of $7,000 a year to consumers, and probably will permit additional consumers to use electricity for cooking and water heating.

CAZENOVIA ELECTRIC CO., Cazenovia, N. Y., has filed a revision of its commercial and power rates for electric service with the New York Public Service Commission under which certain consumers of the company will save about $2,185 annually. The commission permitted the revised rates to become effective January 1.

CAROLINA POWER & LIGHT CO. will put into effect February 3 a $1,000,000-a-year reduction in its rates, Utilities Commissioner Stanley Winborne has announced. An estimated 90,000 customers in North Carolina and South Carolina will be affected by the change, he said. The estimated yearly saving for North Carolina users, he added, will be $716,000—$232,000 for residential customers, $164,000 for commercial lighting, $120,000 for two classes of commercial power consumers, and $200,000 for textile mills. The new residential rates will be: for the first 50 kw.-hr. per month, 3.9 cents per kilowatt hour; next 100 kw.-hr., 2.9 per kilowatt-hour; next 100 kw.-hr., 1.9 cents per kilowatt-hour and for additional 1.5 cents per kilowatt-hour. These compare with the present rates of 5 cents for the first 50 kw.-hr.; 3 cents per kilowatt-hour for the next 50 kw.-hr.; 2 cents per kilowatt-hour for the next 150 kw.-hr.; and 1.5 cents per kilowatt-hour for all additional. New commercial lighting rates are as follows: for the first 1,000 kw.-hr. per month, 3.9 cents per kilowatt-hour; next 3,000 kw.-hr., 2.9 cents per kilowatt-hour; and for all additional 1.5 cents per kilowatt-hour. The present rates provide charges of 5 cents per kilowatt-hour for the first 300 kw.-hr., 4 cents per kilowatt-hour for the next 700 kw.-hr., 3 cents per kilowatt-hour for the next 3,000 kw.-hr. and 2 cents per kilowatt-hour for all additional.

CONSOLIDATED EDISON electric companies have filed with the New York Public Service Commission revised rate schedules, making changes in the determination of demand and extending for six more months the residual stopper in the general rate of the parent company, effective January 1. The changes in the determination of demand conform to an order of the commis-

sion and will have little effect on customers' bills except in the case of the small-power rate of the Brooklyn Edison Co., for which the effect is expected to result in a net reduction of $52,646 in the annual revenues of the company. The extension of the residual stopper will avoid for the present increases which would otherwise occur. The only rate in New York for which estimated demands are now used for billing purposes is the small-power rate of Brooklyn Edison Co. The present determination of demand provides for determination by estimates of 80 per cent of installations under 10 hp., 65 per cent of installations from 10 to 50 hp. and 55 per cent of installations over 50 hp.

ORANGE & ROCKLAND ELECTRIC CO., has filed an amendment to its rate schedules with the New York Public Service Commission under which a retail power rate is cancelled and customers transferred to the general rate with resultant savings to consumers of $14,000 annually.

VIRGINIA PUBLIC SERVICE CO. has announced rate reductions, totaling as much as 9 per cent in some cases. The lower rates became effective January 1. The company also offers a discount for those who pay on or before the "Date Due" as marked on the personal bills.

ROCKLAND LIGHT & POWER CO. has filed rate revisions with the New York Public Service Commission which change the determination of demand and make other minor changes which are estimated to save consumers of the company about $947 annually. The commission permitted the changes to become effective January 1 in the entire territory of the company which includes parts of Rockland, Orange and Sullivan counties.

ALBUQUERQUE, N. M., Town Board has adopted a new rate schedule for all classes of electrical service to consumers. The cuts will affect the city revenue from $8,000 to $9,000 a year, an average of approximately 13 per cent. The largest percentage of decrease was made in the residential rates, the lowest in power.

ANGELICA, N. Y., has filed a general reduction of rates charged by the municipal electric plant with the New York Public Service Commission under which the bills of all customers of the village plant will be reduced. It is estimated that the annual reduction in revenue will be about $1,400.

•

Asks Permit Extension

Wisconsin Electric Power Company has applied to the War Department for a three-year extension of its permit to build a harbor at its Lakeside power plant at Lake. George Post, a vice-president of the utility, explained the latest application was merely to keep alive the permit, which expires December 31, 1938.

•

Ratify Recapitalization

Stockholders of Northern States Power Co. of Delaware have approved the plan of recapitalization dated December 10. The company also has obtained an order from the SEC authorizing it to place the plan in effect.

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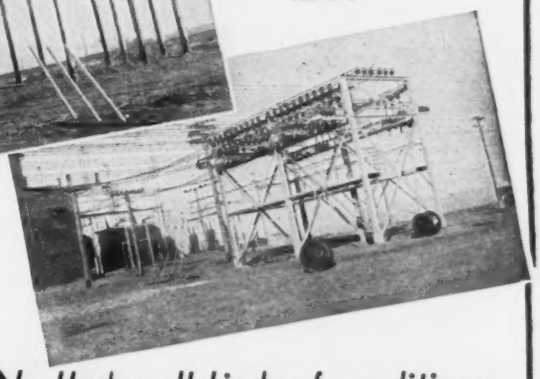

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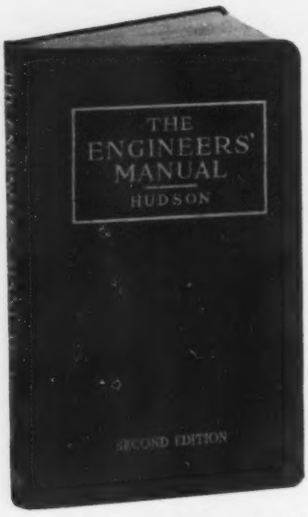

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BOOK REVIEWS

Winding A.C. Motor Coils

By G. A. Van Brunt and A. C. Roe. Published by McGraw-Hill Book Company, New York. 275 pages, illustrated. Price, $3.

Electricians, engineers and repairmen will find here specific instructions on winding a.c. motor coils to modernize obsolescent machines or replace damaged coils. Card forms for coil data, shop codes, conductor and lead arrangements, insulation, end bracing, coil design and forming are given for a wide variety of coils for motors and, to some extent, for turbo-generators. Treatment is practical and instructive.

A closing chapter deals with the potentiality of the new glass fiber insulation in the field of motor coils.

•

Direct-Current Machinery

By Thomas C. McFarland. Published by International Textbook Company, Scranton, Pa. 439 pages, illustrated. Price, $4.

This text, latest of the International series in electrical engineering, is intended for students in d.c. machinery courses who are majoring in electrical engineering. As the author points out, a d.c. text must depend a great deal on arrangement of material for originality. Following a rather comprehensive first chapter on the principles of electricity and magnetism, Professor McFarland takes up the assembly of the machines, proceeding with operating characteristics and control, dealing first with no-load, then with full-load characteristics. The various types of generators and motors are covered and a chapter is included on commutation, as well as one on efficiency, heating and related items. There is a chapter on the installation of generators and motors, a feature not common to most texts.

•

How to Operate Under the Wage and Hour Law

By Feller & Hurwitz. Published by Alexander Publishing Company, 60 Wall Street, New York. 248 pages. Price, $3.50.

Average business men undoubtedly have many misconceptions of the prohibitions, permissions and omissions of the Fair Labor Standards Act. Here they can read it in full, read some of the new administrator's rulings (as recently dated as Ocotber 20) and then read many startling consequences that can confound a heedless and innocent violator. The authors do not soften the blows, nor are they anything but impartial in emphasizing the one-way incidences invokable. Half the book is commentary on the origin of the law, its applicability and details, the administrative procedure, functioning of the respective industry committees and the dire penalties. A catechistic syllabus asks and answers questions as a practical but bewildered business proprietor would likely ask them. There is a treatment of the utterly diffuse status of the criteria for the interstate commerce factors which limit or fail to limit the applicability of the act. Few

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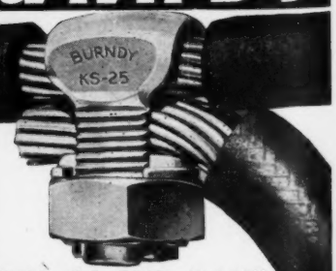

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cited decisions under N.L.R.B. precedents establish anything as interstate commerce —none were utilities. Some day the concept of interstate commerce and the power of Congress to regulate it, say the authors, may "cover all industrial activity in the fields of production, distribution and marketing."

Three appendices (comprising the latter half of this prompt volume) enumerate the analogous N.L.R.B. decisions, give the text of the "wages and hours" bill and study some of the administrator's rulings. There are several helpful functional charts.

•

Problems in Public Utility Economics and Management

By C. O. Ruggles. Published by McGraw-Hill Book Company, New York, N. Y. 772 pages. Price, $6.

As in the 1933 edition, this unique book strives to delineate the economic and management problems of utilities created in an ever-changing social, political and legal world. The specific instances set up for case treatment are practically all new or reoriented to reflect what has happened as an internal evolution and an external pressure in the last five years. These are candid and intimate portrayals of evolution in utility policy as molded to fit public reaction, whether in unorganized consumer relationships or organized civic relationship. With their interpretation and carefully balanced selection by the author, they constitute something even the best of utilities commissioners ought to study as well as they do their stodgy law books.

•

Air Conditioning

By James A. Moyer and Raymond U. Fittz. Published by McGraw-Hill Book Company, New York, N. Y. 455 pages, illustrated. Price, $4.

Air-conditioning technology is stepping along and it is evidenced by frequent revision of books treating the subject with particular emphasis. University extension courses prompted this book and the new second edition adds subject matter, data and working problems which advance in the art indicates to be desirable. Figuring of unit air conditioners, solar and human heat, wall-transmission losses are categories in which new information has been supplied. Other new material pertains to controls and to comparisons of alternative ways of effectuating a controlled atmosphere.

•

Advanced Mathematics for Engineers

By H. W. Reddick and F. H. Miller. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York. 473 pages. Price, $4

Taking the differential calculus for granted, the first chapter reviews the mechanics of solving ordinary differential equations. Here as elsewhere the worked-out and to-be-solved problems are representative of all branches of engineering and consequently the book typifies the trend toward reintegration of the engineering profession. That the book has unique academic usefulness, however, for electrical engineers can be seen from a recital of certain of the eleven chapter titles—hyperbolics, elliptic integrals, Fourier series, Bessel functions, mathematics of fluid and current flow, vector calculus,

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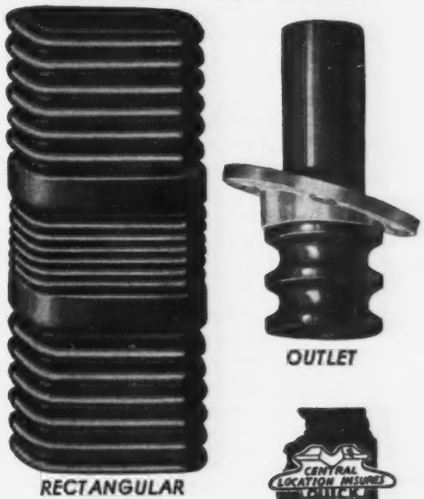

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probability, line integrals, operational calculus. Answers are given to approximately 200 problems posed for solution; of these about one in ten are specifically electrical in basic data, none too large a percentage in view of the essentially electrical origination of hyperbolics, Fourier series, vector analysis and operational calculus.

Virtue for most electrical engineers will probably rest in the degree to which the authors have been successful in (1) indicating the technique of framing a problem in mathematical language and (2) in detailing the transitions and transformations which move the procedure from the abstractions of advanced mathematics into the areas where practising engineers have (or should have) comfortable familiarity.

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A.C. Motors of Fractional Horsepower

By H. H. Jones. Published by Chemical Publishing Company of N. Y., Inc., 148 Lafayette Street, New York. 189 pages, illustrated. Price, $3.

Building up from elementary a.c. principles, this practical little book reveals the empirical procedure that governs the design and construction of most fractional-horsepower motors. Formulation is kept minimized, but not to such degree as to create difficulty in execution of typical ratings and forms of synchronous, induction, series and repulsion motors. It is assumed that core stampings are obtainable by the amateur motor builder. Sections on materials, physical details, testing and silencing (sonic and radio) are helpful for the experimenter. A B. & S. wire table is inserted for American readers.

•

Fundamentals of Electricity and Magnetism

By Leonard B. Loeb. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York. 554 pages, illustrated. Price, $4.

Eight years experience has given the author occasion to revise the first edition fairly extensively as a pedagogical instrument. It still emphasizes the quantitative aspect of physical phenomena in the way he believes paramount for engineering students committed to a two-year course in basic physics, one-fourth of which is devoted to the subject matter of this book. In so far as feasible the flavor of modern atomic-electronic theory of matter permeates the approach to analysis of phenomena. In order to reconcile the resulting incongruities the first 60 pages or so is devoted to a historical résumé of the eight stages through which electromagnetic theory has evolved to its present nuclear hypothesis (they are the static, electrical current, electrochemical, atomic, quantum, wave mechanics and nuclear).

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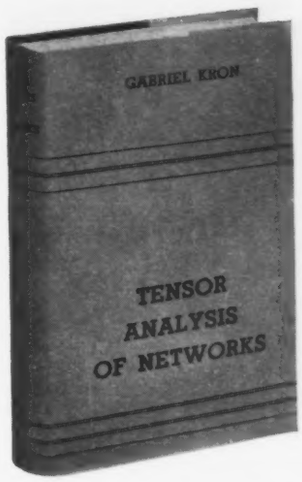

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The advertising rate is $6.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

An advertising inch is measured ⅞" vertically on one column, 3 columns—30 inches—to a page. E. W.

Copy for New Advertisements Received Until Monday 10 A. M. for the Following Saturday's Issue *(published every other week)*

EMPLOYMENT SERVICE

SALARIED POSITIONS. $2,500 to $25,000. This thoroughly organized advertising service of 29 years' recognized standing and reputation carries on preliminary negotiations for positions of the caliber indicated above, through a procedure individualized to each client's personal requirements. Several weeks are required to negotiate and each individual must finance the moderate cost of his own campaign. Retaining fee protected by a refund provision as stipulated in our agreement. Identity is covered and, if employed, present position protected. If your salary has been $2,500 or more, send only name and address for details. R. W. Bixby, Inc., 262 Delward Bldg., Buffalo, N. Y.

EXECUTIVES AND TECHNICAL MEN. Contact employers for positions through our confidential and effective methods. We negotiate preliminary overtures. Established 24 years. Inquiries invited. H. H. Harrison, Director, The National Business Bourse, 20 West Jackson Blvd., Chicago.

POSITIONS WANTED

(See also "Selling Opportunities Wanted")

ENGINEER SUPERINTENDENT 16 years experience, design, construction, operation, Diesel, Hydro, steam plants and systems. Familiar public relations, industrial problems seeks new connections Superintendent Municipal System. PW-574, Electrical World, 520 No. Michigan Ave., Chicago, Ill.

TRANSFORMER SPECIALIST, 20 years experience, design and manufacture, power and distribution transformers, now employed, desires more advantageous position with manufacturer or utility. PW-577, Electrical World, 330 W. 42nd St., New York, N. Y.

(POSITION WANTED)

Electrical Distribution Engineer

- Desires responsible position with public utility, consultant or industrial, where 18 years previous experience in those fields may be best applied.
- Experience includes supervision of design and construction on overhead and underground systems. Also appraisal and depreciation surveys. Age 38.

PW 576, Electrical World,
330 W. 42nd St., New York City.

BECOME AN EXPERT

METERMAN

Now is the time to plan for the rapidly increasing demands of meter departments.

Central Stations everywhere must have thoroly trained men to efficiently handle meter and instrument work. Whether you have a grade school education or a degree in E.E., you can profit as a meter Specialist.

HOME-STUDY COURSE

Up-to-Date Study Course trains you thoroly at home from mathematics of elemental electricity to full understanding of all types of meters, demand meters, instruments, relays, single and polyphase testing, repairing, calibration, maintenance, etc.

Endorsed by Meter Officials Everywhere.

Low Cost—Easy Terms—Diploma Granted
Write Today for Free Booklet!

Ft. Wayne Correspondence School
Dept. 11, Fort Wayne, Ind.

POSITIONS WANTED

GRADUATE CIVIL ENGINEER, 35, married. Thoroughly experienced in design and construction, and in inventory and valuation of Electric Utility plant would like to make change. Experience in continuing inventory records and in plant accounting as required by the Federal Power Act would prove of great value to any utility about to begin or in the midst of this work. Will consider any location. PW-579, Electrical World, 520 N. Michigan Ave., Chicago, Ill.

GRADUATE ELECTRICAL ENGINEER with three years experience in mechanical field, two years in electrical, desires permanent connection in utility or industrial engineering work. Age 28. Married. PW-580, Electrical World, 520 N. Michigan Ave., Chicago, Ill.

SELLING OPPORTUNITIES
OFFERED—WANTED

Selling Agencies—Sales Executives
Salesmen—Additional Lines

OPPORTUNITY OFFERED

Large pole line equipment manufacturer has excellent opportunity for young man between ages of 25 and 35. Prefer graduate electrical engineer. Must have knowledge of distribution and transmission line construction and maintenance. Must have ability to sell and demonstrate. RW-578, Electrical World, 520 N. Michigan Ave., Chicago, Ill.

OPPORTUNITY WANTED

MANUFACTURERS REPRESENTATIVE available for Government work on a commission basis or otherwise. Reputable Construction Engineer of broad experience with Government contracts. Office close to Government Departments in Washington. RA-581, Electrical World, 330 W. 42nd St., New York, N. Y.

FREE BULLETIN

Bulletin #97 of electrical and power plant equipment, 56 pages, 4"x7", classified, indexed and illustrated. Write Chicago Electric Co., 1320 W. 22nd St., Chicago, Illinois.

OFFICIAL PROPOSALS

Bids: January 19 (54)

Electrical Instruments

INSTRUMENTS

P. W. A. PROJECT DOCKET NO. TENN. 1105-P-DS, ELECTRIC DISTRIBUTION SYSTEM, SUB-PROJECT, CONTRACT NO. 7-L

CITY OF CHATTANOOGA, ELECTRIC POWER BOARD OF CHATTANOOGA, CHATTANOOGA, TENNESSEE

Sealed proposals for the furnishing and delivering of Sub-Project, Contract No. 7-L of the Electric Power Board of Chattanooga, acting for and on behalf of the City of Chattanooga, Chattanooga, Tennessee,

P. W. A. Project Docket No. Tenn. 1105-P-DS, Electric Distribution System, Sub-Project, Contract No. 7-L

will be received by the Electric Power Board of Chattanooga, Chattanooga, Tennessee, at the office of the Secretary of the Electric Power Board of Chattanooga, Municipal Building, Chattanooga, Tennessee, until 1:30 P. M. on the 19th day of January, 1939, and will be immediately publicly opened and read by the Electric Power Board of Chattanooga.

Copies of the Proposal, Contract Documents, and Specifications may be obtained from the office of the Electric Power Board of Chattanooga, Municipal Building, Chattanooga, Tennessee. A deposit (certified check) of Twenty-five ($25.00) dollars will be required for procuring the Proposal, Contract Documents and Specifications. The deposit for these documents will be returned to all except the successful bidder upon the return of the documents in good condition within ten (10) days after the bids are opened.

A copy of the Proposal, Contract Documents, and Specifications may be examined free of charge at the Chamber of Commerce and the office of the Electric Power Board of Chattanooga, Chattanooga, Tennessee.

Each bid must be accompanied by a Certified Check, or Bidder's Bond executed by the bidder and a surety company licensed to do business in Tennessee, in the sum of ten (10%) of the amount of the bid. The bond is required as a guarantee that if the bid is accepted, a contract will be immediately entered into and the performance of it properly secured. The successful bidder will be required to execute a Performance Bond in the amount of one hundred (100%) per cent of the contract price. This Performance Bond shall be made through a company having a duly authorized representative in Chattanooga, Tennessee, upon whom process may be served.

All items in the proposal form and on data sheets must be properly filled out and must not be detached from the specifications. No qualifying letters or statements will be considered.

Bidder's name must be placed on the envelope containing this document and also upon this envelope shall be designated the name and contract number which the bid covers.

WITHDRAWAL OF BIDS: Bidders may withdraw bids at any time prior to the opening, but thereafter no bidder may withdraw a bid submitted for a period of sixty days after the date set for the opening of such bids.

The estimated cost of the equipment of the Project covered by this Contract is $3,500.00.

The Electric Power Board of Chattanooga, Chattanooga, Tennessee, reserves the right to reject any and all bids, and to waive informalities therein.

Any bid received after the scheduled closing time for receipt of bids will be returned to the bidder unopened.

CITY OF CHATTANOOGA,
ELECTRIC POWER BOARD OF CHATTANOOGA,
Chattanooga, Tennessee.

By: L. J. WILHOITE, Chairman,
J. C. TWINAM,
G. H. PATTEN,
STANTON E. SMITH.

Will F. Chamlee, Counsel.

Attest:
N. J. Simmons, Secretary.

(Additional Proposal Ad continued on p. 188)

Equipment Wanted—see page 188